Railway Crane
Maintenance Manual

5.1 Electrical system
5.1.1 Switch Cabinets
5.1.2 Junction Boxes and cableways
5.1.3 Batteries
5.1.4 Three- Phase generator
5.1.5 Three- Phase generator on the Emergency Diesel Engine
5.1.6 Hoist and Lowering limit switches
5.1.7 Safe Load Indicator
5.1.8 Lighting and sockets

Switch Cabinets 5.1.1

Description

The superstructure switch cabinets serve to house the essential electrical and electric components which are required to control monitor and supply the crane with power. They are located in the cab rear wall.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot and moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions:

1. Visual check:
   - Check the switch cabinets for any external damage. In particular, check the doors as to whether they close properly. Any faulty seals must be replaced immediately.
   - Check cabin connections for firm seating and damage.

2. To clean:
   - Clean the switch cabinet interior with a suitable cleaning aid. Remove any water which has penetrated into the cabinet. Establish the cause and eliminate.

3. To clean, to grease:
   - Clean the hinges and locks on the switch cabinet door and grease slightly.

Railway Crane
Maintenance Manual

Switch Cabinets	5.1.1

(P-2/2)

Junction Boxes and Cableways 5.1.2

Description

The cableways and junction boxes serve to protect, distribute and fan in the cable looms. To provide a better overview and to protect the individual cables, the cables are concentrated in cableways.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The cane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   - Check the junction boxes for external damage. Ensure, in particular, that the cover is seated properly and tightly. If a cover is not seal properly, electrical equipment can be severely damaged through water and dirt penetrating.
   - Check the cables for external damage, bends or sheering points and check whether the cables are firmly seated in the cable looms.

2. To clean:
   - Clean the junction box interior with a suitable aid (e.g. vacuum cleaner). Eliminate any water, which may have penetrated into the boxes. Establish the cause and eliminate.

Batteries 5.1.3

Description

The batteries are fed by the 3-phase generator of the diesel engine system or the emergency diesel engine. The batteries supply the electrical system of the crane with power. The batteries for the diesel engine are located a drawer behind the cab to protect them from external influences.

Safety Instruction

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Never place objects or tools on the batteries. Keep the batteries clean and dry – Danger of short-circuiting!
Use caution when handling battery acid. Observe the respective safety regulations. Avoid contact with skin and do not drink - Danger of causticization!
Do not drink the purified water – Danger of poisoning!
No smoking, no naked flame or light, sparks or glowing ashes near the batteries – Danger of explosion and fire!
Caution near the overhead lines! Do not climb up onto crane superstructure!
Mortal danger!

Maintenance Instructions

1. Visual Check:
   - Pull out the battery drawer.
   - Check the batteries and the cable-connecting terminal for external damage.
   - Check whether the batteries are firmly seated on the battery carrier; if required, tighten the mounting bolts on the retainer bar.
2. To check the electrolyte level:
   Screw out the filler plugs and check the electrolyte level; if required, top up the distilled water to the marking.
3. To clean and dry battery covers:
   Clean battery covers with a suitable aid according to regulations and then dry to avoid leakage current. If moisture has penetrated in to the batteries, find the cause and eliminate it.
4. To clean the terminal:
   Clean the cable connecting terminals, grease with pole grease and check for firm seating. Then close the battery drawer.

Three – Phase Generator 5.1.4

Description

The generator (item 1) converts the mechanical power of the flange-mounted hydraulic motor into electric power.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one in near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

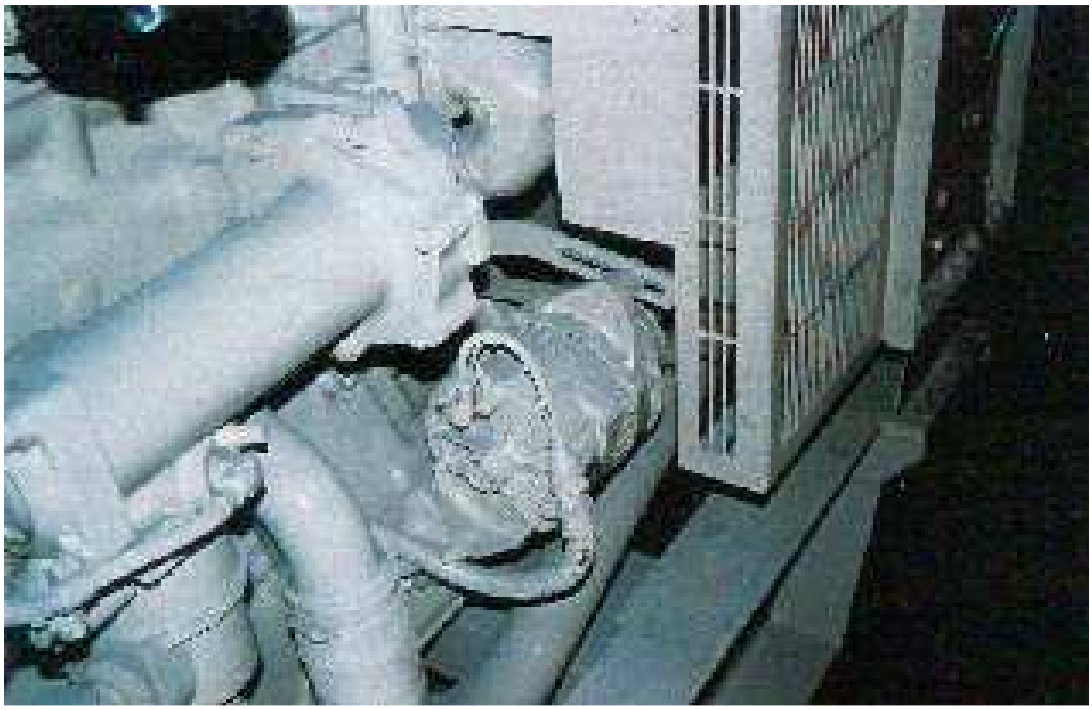
Maintenance Instruction

1. Visual check:
   - Check the generator and its connections for firm seating and external damage.

2. Fan belt and fan belt tensioning:
   The fan belt and its tensioning are dealt with in the section on maintenance work for the diesel engine.

Note:
When the engine is running:

- do not switch off the battery main switch
- do not release battery terminals, pole terminals or lines in the mains
- and when the battery charged status control lamp illuminates, switch off the engine immediately.
- do not allow the generator to run without being connected to the battery.
- It is not permissible to short–circuit (or tap) the connections on the generator and the controller among one other or by earthing.



Three-Phase Generator on the Emergency Diesel Engine 5.1.5

Description

The 3-phase generator on the emergency diesel engine feeds the batteries during emergency operation and thus supplies the electric equipment of the crane with power.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot and moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   - Check the generator and its connections for firm seating and external damage.

2. Fan belt and fan belt tensioning:
   The fan belt and tensioning are dealt with in the section on maintenance work for the emergency diesel engine.

Note:
When the engine is running:
- do not switch off the battery main switch.
- do not release battery terminals, pole terminals or lines in the mains.
- and when the battery charged status control lamp illuminates, switch off the engine immediately.
- do not allow the generator to run without being connected to the battery.
- it is not permissible to short-circuit (or tap) the connections on the generator and the controller among one other or by earthing.

Hoist and Lowering Limit Switches 5.1.6

Description

The crane has limit switches for the main and auxiliary hoists as well as for the derricking gear.

Derricking gear:

The limit switches for the derricking gear are mounted directly on the rope drum. In working range, the limit switches switch off in the steepest or lowest boom working positions. In addition, when the bridging switch is activated, the derricking motion is switched off in the lowest boom position for transport purposes or in the steepest position for raising/lowering the counterweight.

Main and auxiliary hoists:

Both hoists are fitted with a hoist and lowering limit switch, which are located on their respective hoist drums. The hoist limit switches switch off the hook in the highest hook position and thus prevent the hook gear from being pulled into the boom head. The lowering limit switches switch off the hoist in the lowest hook position and thus prevent the rope from uncoiling beyond the required remaining safety windings.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.

In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.

The crane must not be in the way of other vehicles.

Caution near the overhead lines! Do not climb up onto the crane superstructure! Mortal danger!

Ensure that no one in near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

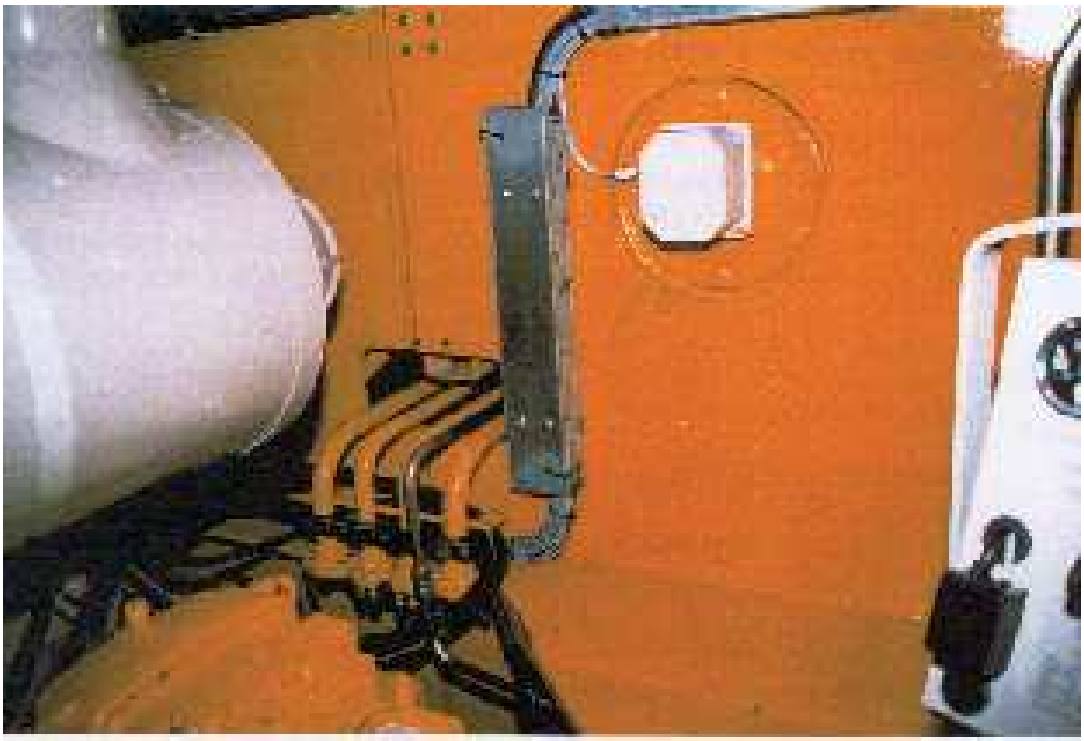
1. Visual check:
   Check the limit switches (see figure) and their mountings and connections for external damage and firm seating.

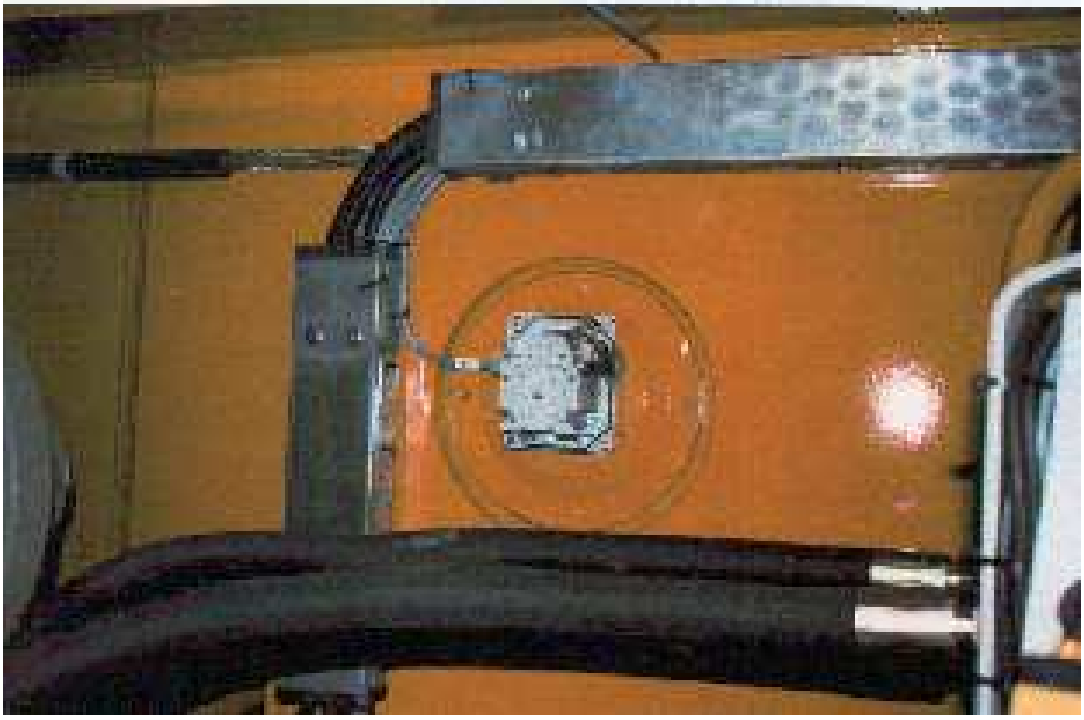
2. To Clean:
   Open the limit switches and their mountings and connections for external damage and firm seating.

3. Functional test:
   The functional test must be carried out without load. Approach all the switching points slowly as described under “Function” and check for proper functioning.

Hoist and Lowering Limit Switches **5.1.6**

(P-2/2)





Safe Load Indicator 5.1.7

Description

The safe load indicator ensures that crane elements are not subject to overload in all working positions and to ensure that the crane does not tip over because the load lifted exceeds the lifting capacity in the particular configuration.
The safe load indicator functions based on:

- the limit switches near the rotary lead-through to sense the superstructure position
- the selected outrigger base
- the load cells on the load sensor locate the fixed point between hoist ropes and the hook
- the angle sensor on the boom (see figure)

The respective data is shown on the control and display panel in the cab.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Caution near the overhead lines! Do not climb up onto the crane superstructure! Mortal danger!
Ensure that no one in near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   - Check the limit switches, the load cells and the angle sensor for damage and firm seating.

2. Functional test:
   - When the functional test is carried out, all the limit switch switch-off points must be approached with care. Check as to whether the controls on the panel show the proper indication. In addition, check as to whether the limit switches switch off properly.

Railway Crane
Maintenance Manual

Safe Load Indicator	5.1.7

Lighting and Sockets 5.1.8

Description

The crane lighting consists of:

- Control panel lighting
- Cab lighting
- Machinery house lighting
- two swivelable halogen spotlights for crane operation, one each to the left and right of the cab from side (see left hand figure)
- a swivelable halogen spotlight for crane operation located up behind the superstructure.
- a spotlight located behind the cab for checking the hoist and derricking gears,
- the outrigger lighting on the superstructure near each superstructure corner.
- two (red) travel lights at the front of the superstructure and at the rear of the counterweight.
- two adjustable spotlights on the boom head.

In addition, the crane is fitted with five 24 V sockets (see figure to the right) of which one is located in the cab and one each is located at the front and rear of each crane side.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling. In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.

The crane must not be in the way of other vehicles.

Caution near the overhead lines! Do not climb up onto the crane superstructure! Mortal Danger!

Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions:

1. **Visual check:**
   Check all the lighting elements of the crane, their mountings and cable connections for damage, firm seating and moisture. Damaged or moist lighting fixtures must be replaced. Any damaged or faulty sockets must also be replaced.
2. **To Clean:**
   Clean the lighting fixtures with a suitable aid.
3. **Functional Control:**
   Check the lighting elements for proper functioning. Any faulty lamps or lighting element with broken glass must be replaced. Any faulty lamps or lighting element with broken lamps must be replaced immediately.

5.2.1 Main Pumps
5.2.2 Secondary Pumps
5.2.3 Hydraulic Oil Tank
5.2.4 Slewing Gear Pump Filter
5.2.5 Rotary Lead-Through
5.2.6 Suspension Blocking Cylinders
5.2.7 Undercarriage Control Blocks
5.2.8 Outrigger Cylinders
5.2.9 Hoist, Derricking Gear, Slewing Gear and Travel Gear Motors
5.2.10 Superstructure Control Blocks
5.2.11 Counterweight Cylinders
5.2.12 Boom Root Point Cylinder

Main Pumps 5.2.1

Description

The Crane has a main pump assembly which is located directly downstream of the pump distributor gearbox on the diesel engine.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution – Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available. Observe disposal regulations!
Caution! - sections of the hydraulic and air pressure systems are still under pressure even when the crane is at standstill.

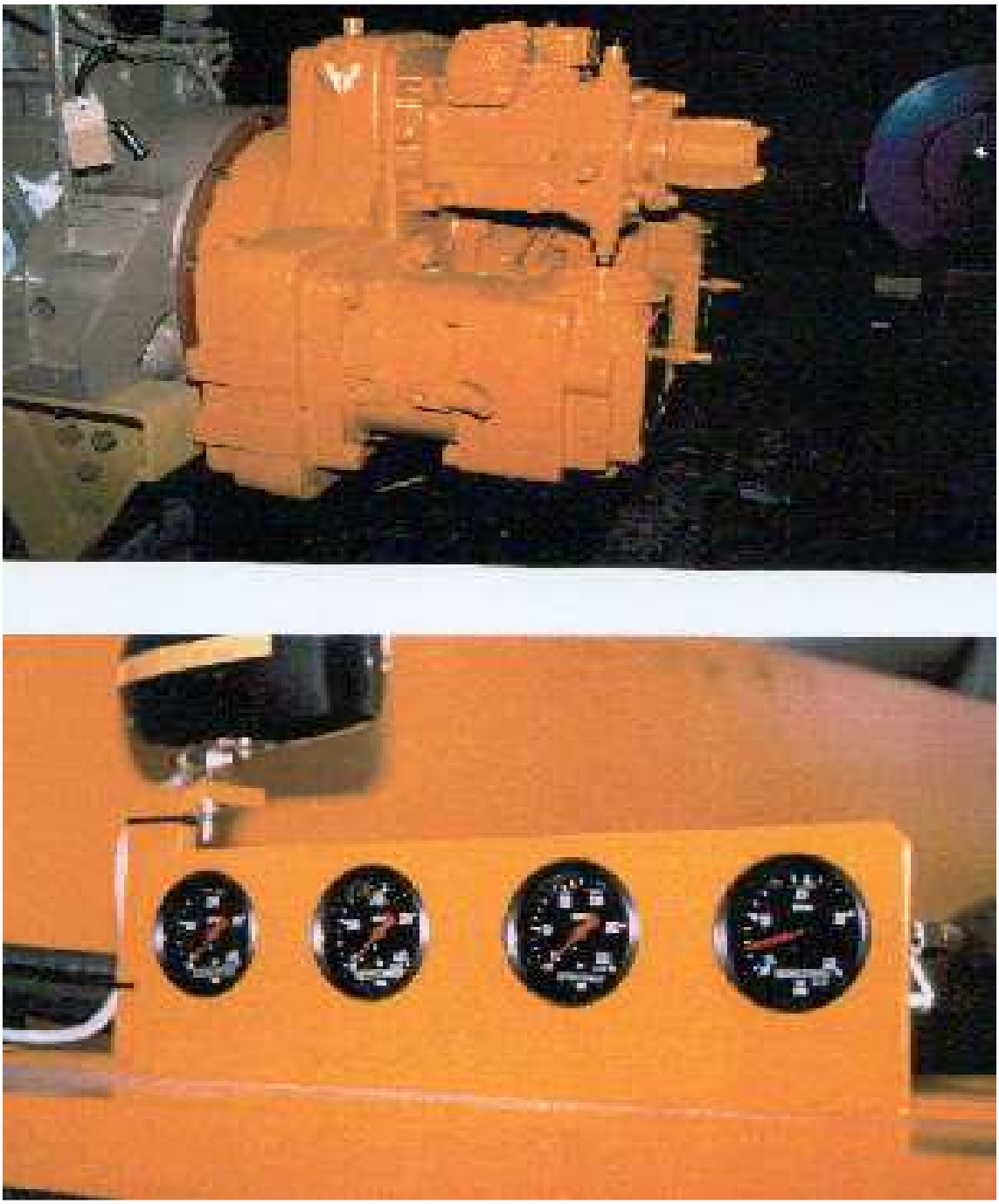
Maintenance Instructions

1. Visual check:
   Check the pumps (see figure at the top) and their connections for external damage and leakages.
2. Running Noises:
   The running noises of the pumps must be checked. An increase in the running noises coupled with an increase in pressure indicate pump damage. In this case, the crane must not be operated and the pump must be replaced.
3. Pressure Indicators:
   During operation, the operating pressure can be checked by means of pressure gases mounted behind the cab (see figure at the bottom). Faulty pressure gauges must be replaced:

Item No: 1	Control Oil	Operating Pressure: max: 30 bar
Item No: 2	Slewing Gear	Operating Pressure: max: 250 bar
Item No: 3	Pump 1	Operating Pressure: max: 400 bar
Item No: 4	Pump 2	Operating Pressure: max: 400 bar

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.
Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate 10 µm must be used.

Caution! - If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer serve damage.



Secondary pumps 5.2.2

Description

The secondary pump for emergency operation is located on the emergency diesel engine.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one in near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections those higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available. Observe disposal regulations!
Caution!- sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions:

1. Trial run:
   As the secondary pumps on the emergency diesel engine do not run in normal operation, it is necessary to carry out a trial run. The trial run must last at least 5 minutes against a minimum pressure of 5 bar to a maximum pressure of 200 bar.
2. Visual Check:
   Check the pumps and their connections for external damage and leakages.
3. Running noises:
   The running noises of the pumps must be checked. An increase in the running noises coupled with an increase in pressure indicate pump damage. In this case, the crane must not be operated and the pump must be replaced.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

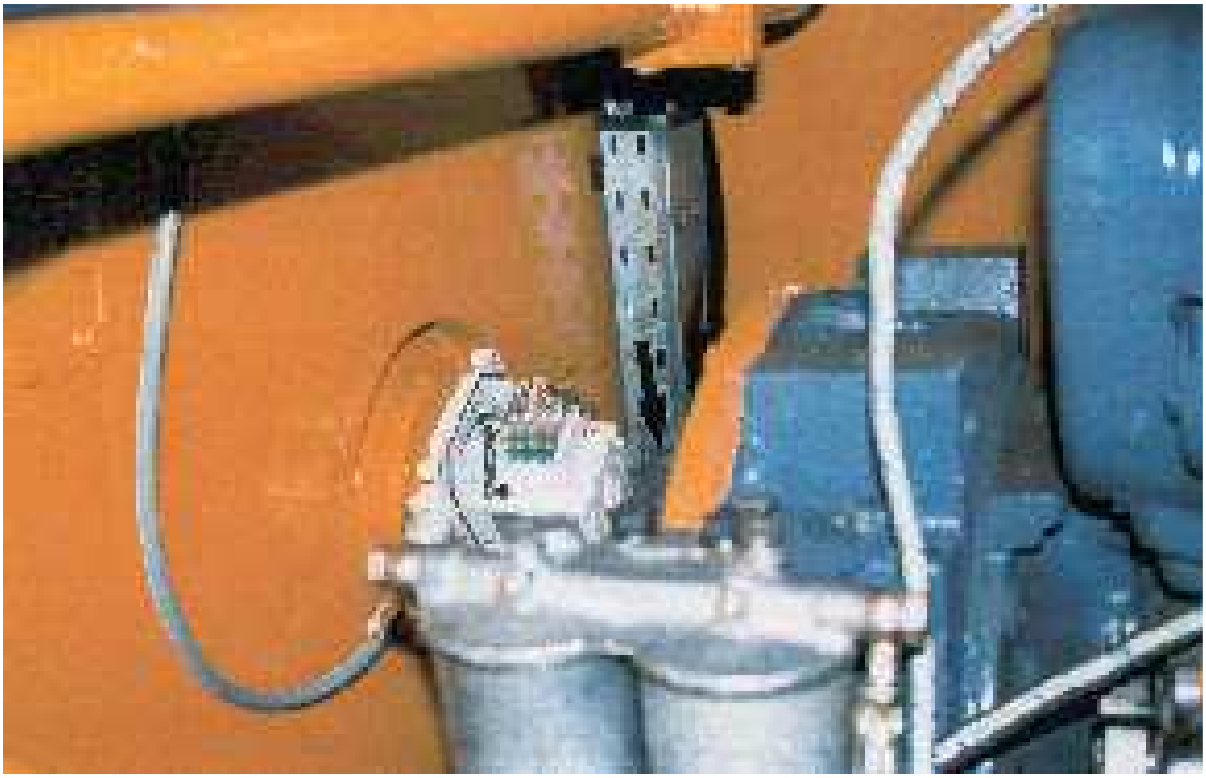
Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Secondary pumps	**5.2.2**

(P-2/2)



Hydraulic Oil Tank 5.2.3

Description

The hydraulic oil tank serves to store the hydraulic oil for the hydraulic system. The hydraulic oil is added, topped up and drained via the tank. The built-in filter filters the return hydraulic oil flow. The tank capacity is approx. 1130 l.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane can not be switched on and is secured against rolling.
In addition, a “maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scaled!
Caution! - Hydraulic System! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution! - Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
   Check the hydraulic oil tank and its connections for external damage and leakages.

2. To check the oil level:
   The oil level can be read off by means of the oil level glasses (See Figure on the right) on the tank side. The oil level must be checked at operating temperature. The maximum oil level has been reached when all the cylinders are retracted. The oil must not fall below a minimum level when all the cylinders are completely extended.
   The oil temperature is sensed via a temperature sensor. A oil temperature of more than 70^0C is indicated in the cab by means of a control lamp. In this case, operation must be stopped until the oil temperature drops below 70^0C.

3. To add oil:
   When oil is added, it must be poured through a guilt-in oil filter or an external mounted filter assembly with a filter absolute fineness of 10 µm. Caution - Only use oil of the same brand for topping up!

4. To change oil:
   - To drain the oil:

   The oil tank unit consists of two connected tanks. As the connection between the tanks is higher than that of the oil drain, a drain piece must be mounted on each tank section. The oil is drained via the oil drain plug below the hydraulic tank. Caution – oil quantity approx. 1,130 l! Then add oil as described under 3.

5. To check the breather filters:

   The breather filters are installed on the tank upper side (see figure at the top and bottom right). Whenever hydraulic oil is topped up, the filter cartridges of the breather filter must be checked and if required, replaced. To do so, unscrew the filter cover, change the cartridges and screw on the cover again tightly.

6. To check the oil filter and if required, change:
   - To carry out a visual check on the impact pressure indicator:

     The oil filter has a visual impact pressure indicator (See Figure at the bottom). When the oil is at operating temperature, the indicator must be in the green zone. If the indicator is already in the yellow zone, it is advisable to change the filter insert. If the filter is clogged, the indicator is in the red zone. In this case, the filter insert must be replaced.

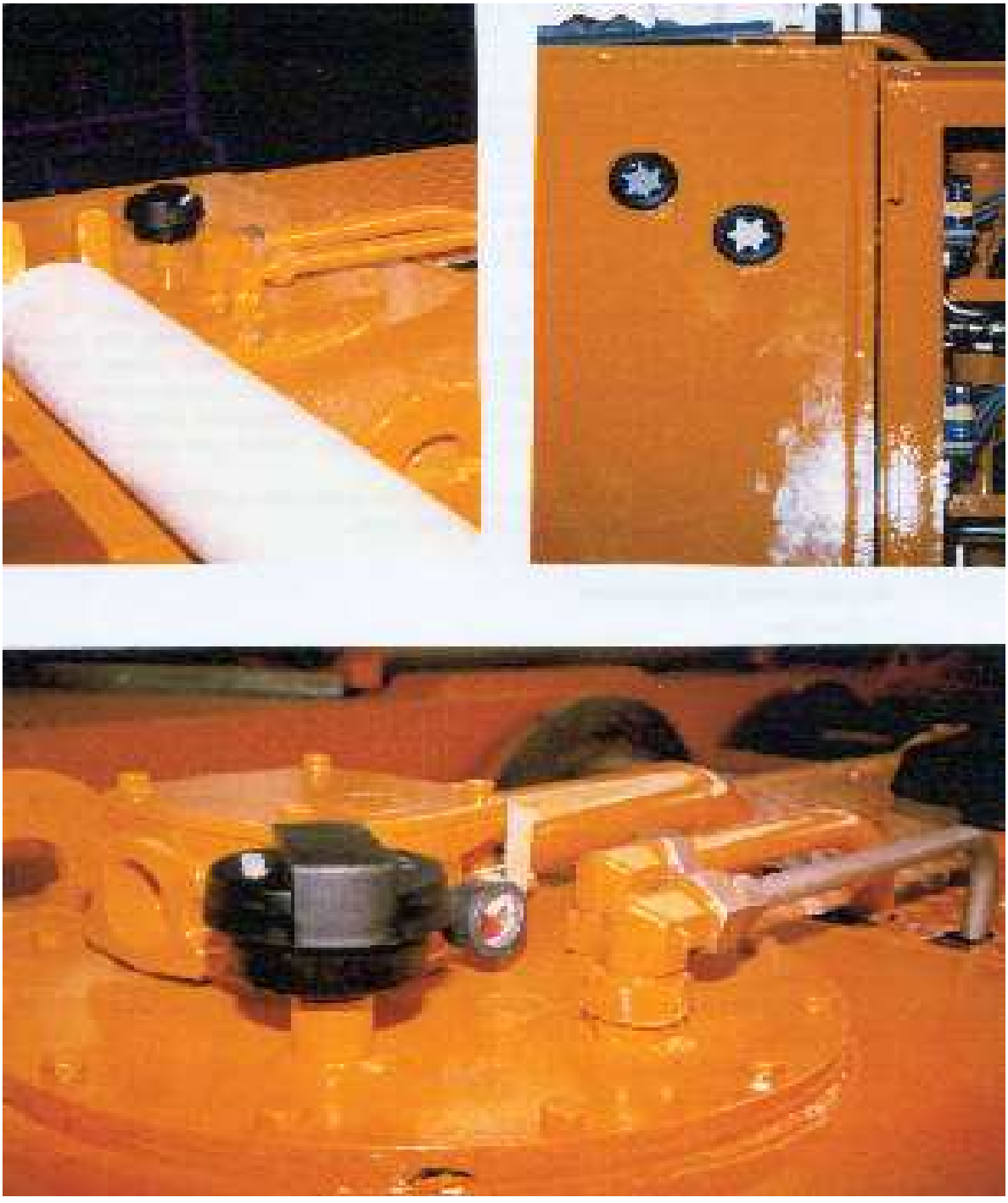
     Note: Only replacement filter element with the corresponding purchase number on their rating plate must be installed. The filter inserts cannot be simply cleaned.
   - To change the filter inserts:
     - To change the filter element, unscrew the screws on the filter cover.
     - Then turn the cover 45^0 and lift off.
     - Then remove the filter insert and the dirt pan.
     - Then clean the dirt pan with a suitable cleaning agent and insert onto the new filter insert.
     - Before the filter element is re-installed, ensure that the seal is in proper order; if required, replace.
     - Once the element has been installed, check for tight sealing.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as other wise the hydraulic system could suffer severe damage.

Hydraulic Oil Tank	5.2.3



Slewing Gear Pump Filter 5.2.4

Description
The hydraulic oil flow of the slewing gear pump is cleaned via line filter.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near to or moving parts- danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensue an adequately sized drip pan is available. Observe disposal; regulations!
Caution! – Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
   Check the filter and its connections and mountings for external damage, leakages or firm seating.
2. Pollution indicator:
   The filter is fitted with a visual pollution indicator. When the oil is at operating temperature, the red indicator on the filter must not be visible.
3. To change the filter;
   - It is not possible to clean the filter insert. It must be replaced when clogged.
   - Prior to changing the filter insert, first release the pressure via the pressure drain plug on the under side of the filter body.
   - Then unscrew the filter body, remove the filter insert, empty the filter body and clean thoroughly. Check the thread and the seals as to whether they are in good condition and then wet with hydraulic oil.
   - Prior to inserting the new filter element, screw the pressure drain plug tightly on.
   - Screw in the filter body by hand until the mechanical stop. Then it must be loosed by ¼ rotation. The sealing effect is not better as a result of increased tightening.
   - On completion of maintenance, check filter for proper sealing.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stopcocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Slewing Gear Pump Filter	**5.2.4**

(P-3/3)

Rotary Lead- Through 5.2.5

Description

The rotary lead-through is a rotary hydraulic connection between the undercarriage and the superstructure. In addition, it houses the ducts for the air pressure supply.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution- Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual Check:
   Check the hoses, their connections and attachments for external damage, firm seating and proper sealing.
   - Replace any damaged components immediately. Any loose or leady connections must be tightened or if required, replaced.
   - Check the carrier for the rotary lead- through for correcting seating and damage.

   Caution- The rotary lead- through must not be twisted, as otherwise the built-in seals will be damaged.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

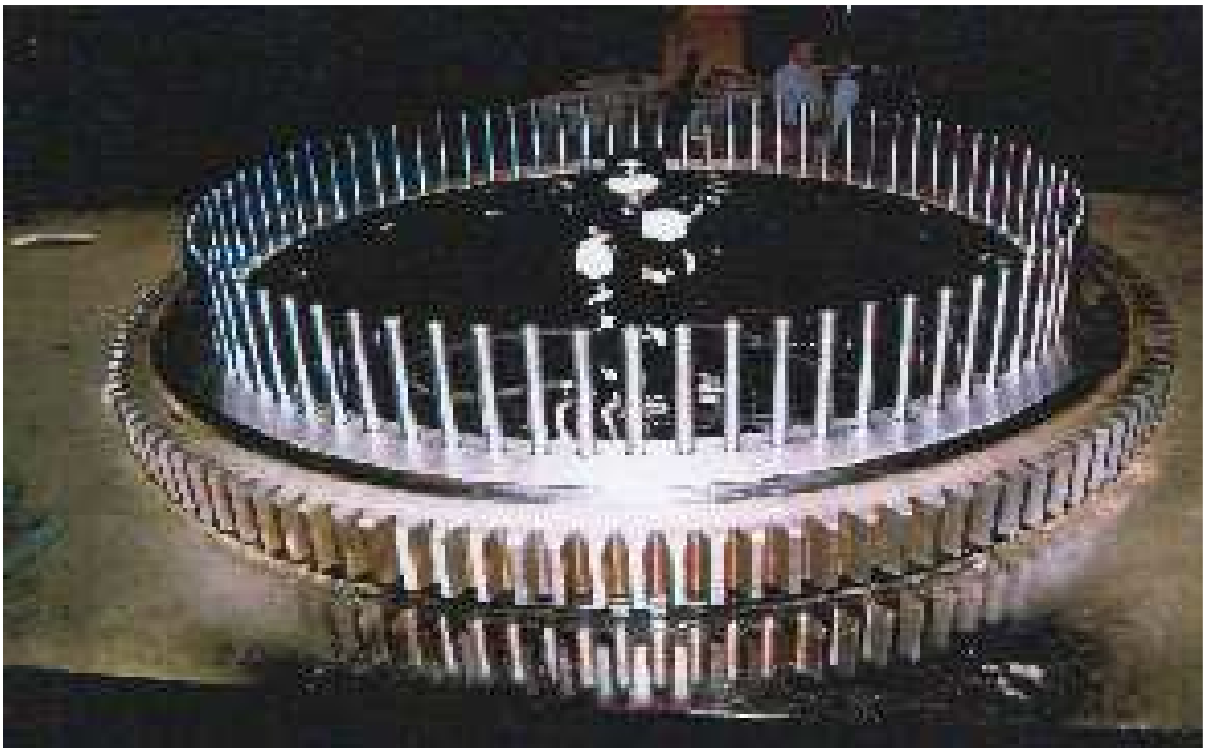
Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution!- If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Rotary Lead- Through	**5.2.5**

(P-2/2)



Suspension Blocking Cylinders 5.2.6

Description

The suspension blocking cylinders serve to lock the suspension spring deflection to the wheel set springs during crane operation. The suspension blocking cylinders are single-acting plunger-type cylinders with spring-return mechanism. The undercarriage hydraulics must be switched on via the respective selector switch in the cab.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution! – Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill!
Use caution when opening the suspension blocking cylinders! The pistons are spring-loaded-Danger of accidents! Mortal danger!

Maintenance Instructions

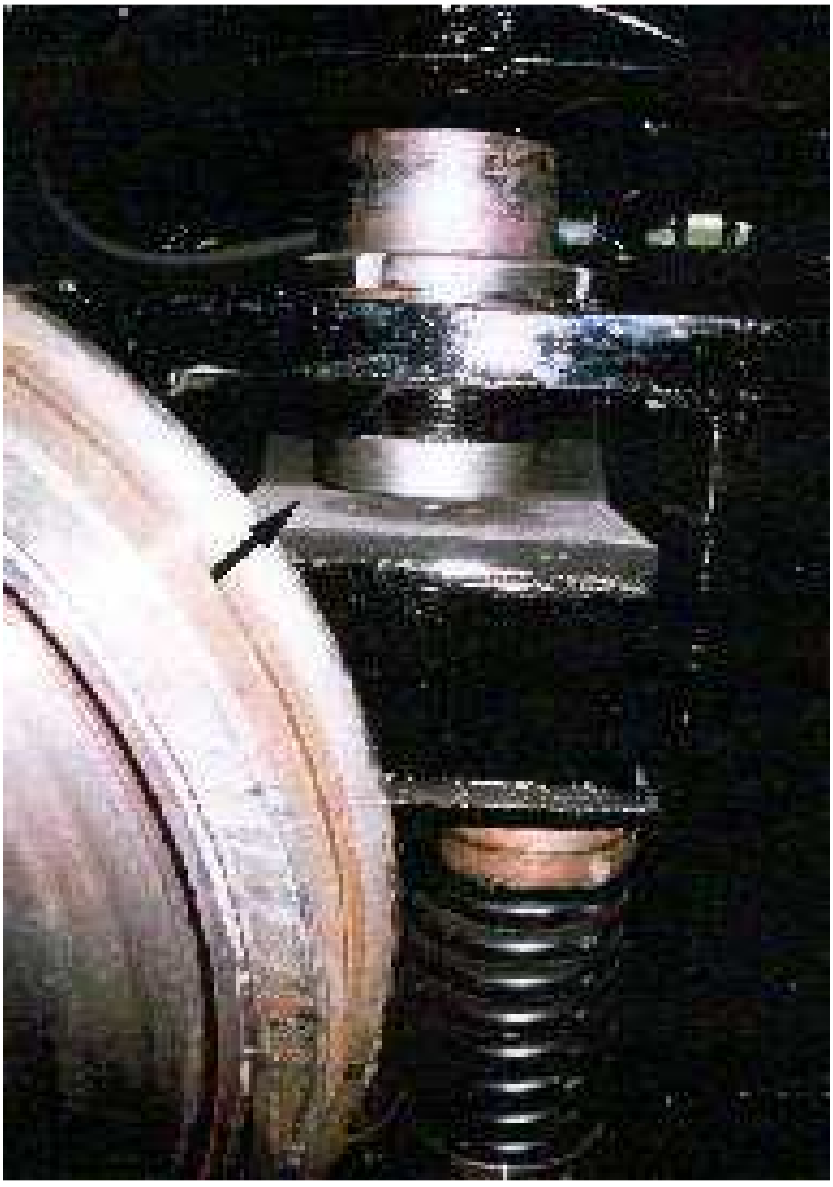
1. Visual check:
   Check the blocking cylinders and their connections for external damage, proper sealing and firm seating.

2. Functional test:
   Retract and extend the cylinders. In particular, check for proper retraction and at the same time carry out an inspection of the piston rods.

   Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

   Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

   Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.



Undercarriage Control Blocks 5.2.7

Description

The control blocks in the undercarriage serve to retract and extend, raise and lower the outriggers, operate the suspension blocking and to disengage the travel gear pinion. The undercarriage hydraulics must be switched on via the selector switch in the cab.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution! – Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill!

Maintenance Instructions

1. Visual check:
   Check the valve blocks and their connections for external damage and leakages.
   - Tighten the fittings, if required, but only when they are not under pressure. Then carry out a sealing test under pressure.

2. Functional Test:
   - Check each of the jack and extension cylinders directly by means of the hand levers.
   - The suspension blocking and travel gear pinion disengagement device are operated by means of one hand lever.

   Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

   Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10µm must be used.

   Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Undercarriage Control Blocks	**5.2.7**

(P-2/2)

Outrigger Beam Cylinders 5.2.8

Description

The crane is fitted with four outrigger beams. Each outrigger beam has a swing-out cylinder (see right hand figure) and a jack cylinder (see left hand figure) with spring-stop and check valve.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensue an adequately sized drip pan is available. Observe disposal; regulations!
Caution! – Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual Check:
   - Check the cylinders and their connections for external damage, firm seating and proper sealing.
   - Tighten or replace loose or leaky connections when the system is not under pressure.
   - On completion of maintenance work, carry out a sealing test under pressure.
   - The piston rods of the cylinders are automatically lubricated when the cylinders are retracted.
   - The piston rods of the jack cylinder latch into retracted position automatically.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Hoist, Derricking, Slew and Travel Gear Motors 5.2.9

Description

Both hoists (item 1 and 2), the derricking gear (item 4), the slew gear (item 3), the two travel gears (item 5) and the recovery winch (not illustrated) are driven by the same type of axial piston constant motor. The motors are lubricated by means of the hydraulic oil system and are thus more or less maintenance-free.

Safety Instructions

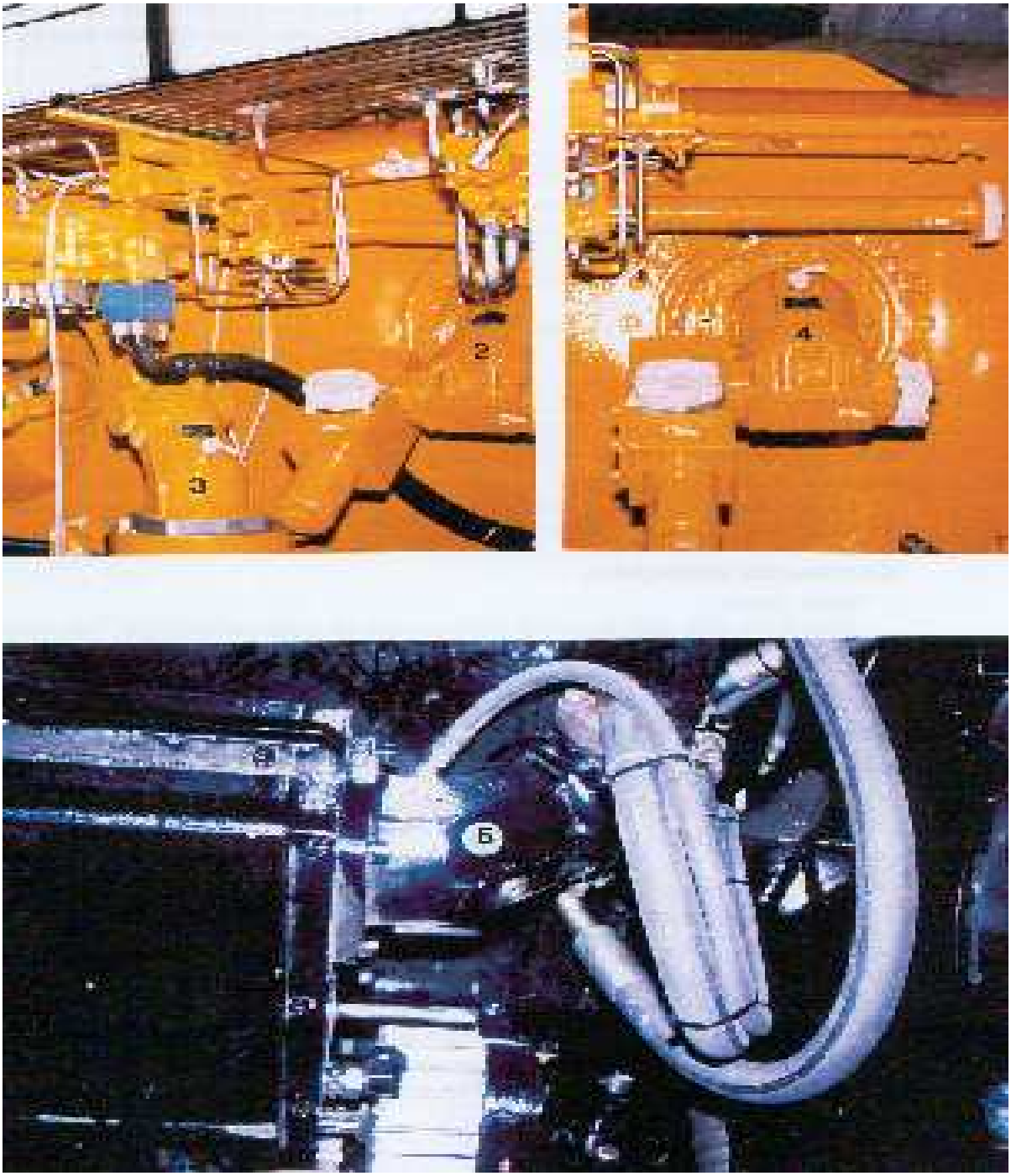
Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution!- sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
   Check the motors and their connections for firm seating, external damage and proper sealing.
   Note: Motors are lubricated by means of leakage oil - this is why no oil change is required!
2. Running Noises:
   Check the running noises of the motors; if the level of the running noise has increased in connection with an increase in pressure, the motors could be damaged.
   - The maximum permissible leakage oil quantity of the hydraulic motor is 15 l/min at operating pressure. The leakage oil connection must not be closed under any circumstances as the hydraulic motors could be destroyed as a result.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections. Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 micrometer must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.


2
3
4
5
6

Superstructure Control Blocks 5.2.10

Description

The superstructure control blocks control the crane and travel motions. The individual control levers (gate valves) are operated via pilot control valves from within the cab.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution - Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution!- sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
    - Check the control blocks and their connections for external damage and leakages.
    - Tighten the fittings; if required, but when the system is not under pressure. Then carry out a sealing test under pressure.

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections. Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10µm must be used.

Caution! If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Superstructure Control Blocks	5.2.10

(P-2/2)

Counterweight Cylinders 5.2.11

Description

The counterweight is fitted with five hydraulic cylinders. Two counterweight cylinders lower sections of the counterweight for transport purposes onto the undercarriage. Two other cylinders allow the counterweight to be extended and retracted. One hydraulic cylinder folds the counterweight gallows, which can be swivelled on the superstructure to the rear.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane can not be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationery. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available. Observe disposal regulations!
Caution! Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
   - Check the cylinders and their connections for external damage, firm seating and proper sealing.
   - Tighten or replace loose or leaky connections when the system is not under pressure.
   - On completion of maintenance work, carry out a sealing test under pressure.

2. To clean, grease, lubricate:
   - The piston rods are lubricated on retraction automatically. Clean the bolt connections of the components and grease with a suitable lubricants.
   - Lubricate the cylinders by means of the lubrication ripples.

3. Carry out a functional test:
   Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.

   Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

   Caution! - If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Counterweight Cylinders	**5.2.11**

(P-2/2)

Boom Root Point Cylinders 5.2.12

Description

In order to lower the boom according to regulations, the boom must be pushed out of the boom root point via the two boom root point cylinders.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane can not be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Use caution when dealing with oil danger of being burnt or scalded!
Caution- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure in the system and the diesel engine is stationery. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections that higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available. Observe disposal regulations!
Caution! Sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.
Caution near the overhead lines! Do not climb up onto the crane superstructure!
Mortal danger!

Maintenance Instructions

2. Visual check:
   - Check the cylinders and their connections for external damage, firm seating and proper sealing.
   - Tighten or replace loose or leaky connections when the system is not under pressure.
   - On completion of maintenance work, carry out a sealing test under pressure.

2. To clean, grease, lubricate:
   - The piston rods are lubricated on retraction automatically. Clean the bolt connections of the components and grease with a suitable lubricants.
   - Lubricate the cylinders by means of the lubrication ripples.

3. Carry out a functional test:

Note: After work has been completed on the hydraulic system, during which oil has been lost out of the hydraulic circuit, top up the hydraulic oil in the housings of the hydraulic pumps and hydraulic motors via their respective leakage oil connections.
Otherwise, the hydraulic system could suffer severe damage. To replace or top up oil, an external oil filter with a minimum retaining rate of 10 µm must be used.

Caution! - If the oil stop cocks below the hydraulic oil tank are closed for work being performed on the hydraulic system, check as to whether the stop cocks have been re-opened prior to re-starting as otherwise the hydraulic system could suffer severe damage.

Railway Crane
Maintenance Manual

Boom Root Point Cylinders	**5.2.12**

(P-2/2)

Railway Crane
Maintenance Manual

Air pressure System **5.3**

5.3.1 Air pressure Tank
5.3.2 Brake Cylinder
5.3.3 Brake couplings
5.3.4 Air pressure Fine Filter
5.3.5 Brake Pedal
5.3.6 Signal Horns
5.3.7 Undercarriage Air Pressure Compressor
5.3.8 Pressure Regulator

Air Pressure Tank 5.3.1

Description

The crane has three 50 litre air pressure tanks, two 25 litres air pressure tanks, three 14 litres air pressure tanks, one 5 litre air pressure tank and two 9 litre air pressure tanks in the superstructure.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! - Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution! Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.

Maintenance Instructions

1. Visual check:

   Check the air pressure tanks and their components for external damage, firm seating and proper sealing. Tighten fittings, if required, when the system is not under pressure.

2. To drain off:

   Loosen the drainage plugs until no more moisture emerges. A high degree of moisture can damage the air pressure system. In this case, the air pressure fine filter must also be checked; if required, the filter element must be changed in between normal intervals and/or the air pressure filter must be drained more frequently.

Railway Crane
Maintenance Manual

Air Pressure Tank	5.3.1

(P-2/2)

Brake Cylinders 5.3.2

Description

The twelve brake cylinders are single-acting air pressure cylinders with automatic brake expander cups and spring–return mechanism. Six brake cylinders are fitted with a spring-loaded assembly which can be activated by means of a mechanical emergency release device connected to Bowden cables on the axles.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! - Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution!- Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened
Caution!- In this case, braking cannot be carried out until the brake system is re-pressurised with air pressure.
Use caution when the brake cylinders are opened! The brake cylinders are under spring-loaded tension! Danger of accidents! Mortal Danger!

Maintenance Instructions

1. Visual check:
   Check the brake cylinders and their components for external damage, firm seating and proper sealing. Tighten fittings, if required, when the system is not under pressure.

2. Functional test:
   Carry out a brake test and inspection when the crane is at a standstill! Check whether all cylinders are extended properly.

Railway Crane
Maintenance Manual

Brake Cylinders	**5.3.2**

(P-2/2)

Brake Couplings 5.3.3

Description

The three brake couplings on each face side together with the stop cocks serve in train formation to couple the crane to the customary train air pressure brake system. The air pressure brake system consists of a main air line, the main air tank line and the vacuum line.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be witched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! - Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution!- Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.

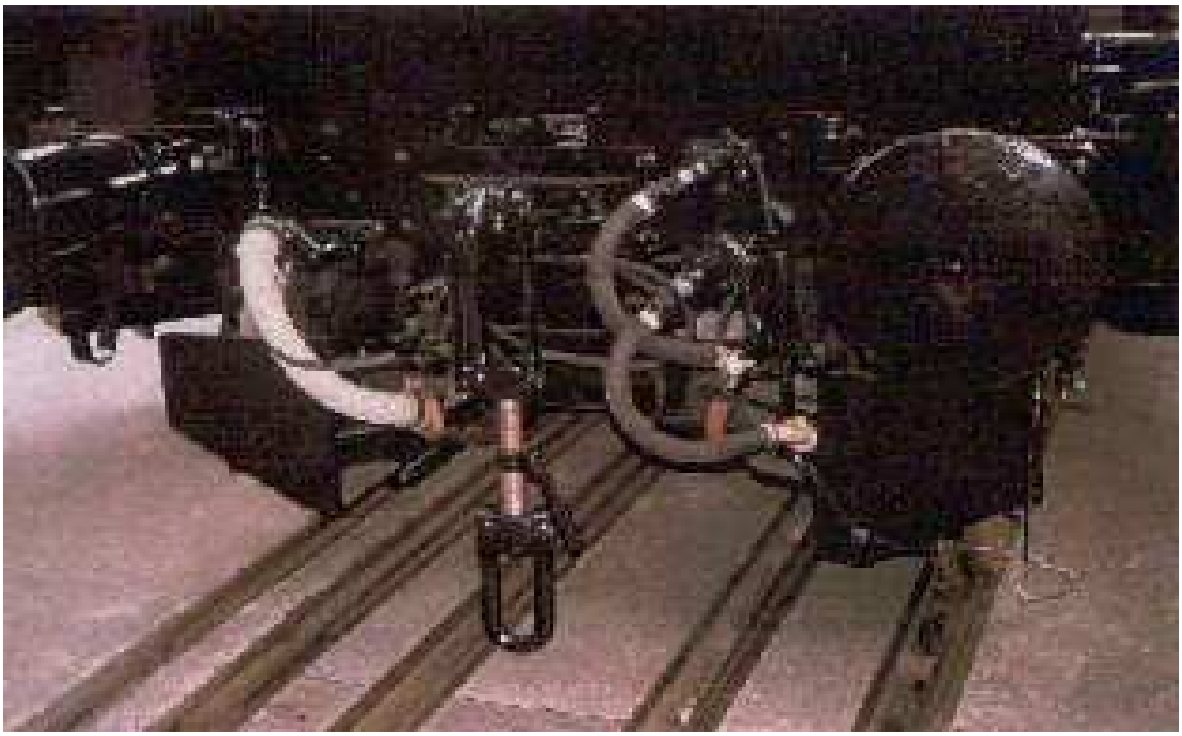
Maintenance Instructions

1. Visual check:
   Check the brake couplings, their connections and pertaining cock stops and dummy couplings for external damage, proper sealing and firm seating.

Railway Crane
Maintenance Manual

Brake Couplings	**5.3.3**

(P-2/2)



Air Pressure Fine filter 5.3.4

Description

The air pressure system is fitted with an air pressure fine filter. The fine filter has a drainage option and a filter element.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! - Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution! - Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.

Maintenance Instructions

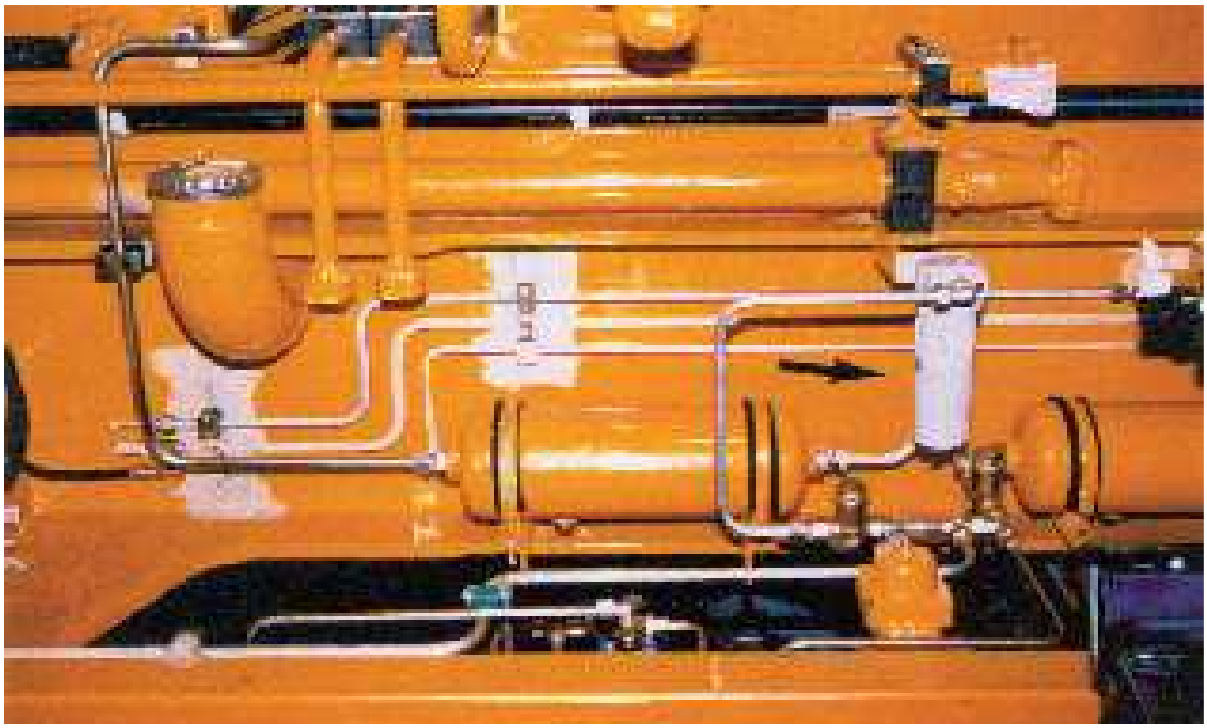
1 Visual check:
Check the air pressure fine filter, its mountings and connections for external damage, firm seating and proper sealing. In addition, clean the cooling spiral.

2. Check the filter element:
Unscrew the air pressure fine filter and check the fine filter element for its degree of pollution or damage; if required, replace.

Railway Crane
Maintenance Manual

Air Pressure Fine filter	5.3.4

(P-2/2)



Brake Pedal 5.3.5

Description

The brake pedal in the cab serve to smoothly and directly brake the travel motion.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! - Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution!- Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a stand still! This also applicable when air pressure connections are being tightened.

Maintenance Instructions

1. Visual check:
   Check the brake pedal and its mountings for external damage and firm seating.

2. To Clean:
   Clean the brake pedal with a suitable aid.
   Dirty or oily pedals can endanger safety!

Railway Crane
Maintenance Manual

Brake Pedal	5.3.5

(P-2/2)

Signal Horns 5.3.6

Description

The two signal horns serve as an audible warning during travel and crane operations. They are located on the crane at the front and the rear.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and outside the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution!- Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.

Maintenance Instructions

1. Visual check:
   Check the signal horns and their connections for external damage, firm seating and proper sealing.

2. Functional Test:
   Clean the horn elements and test the signal horns.

Railway Crane
Maintenance Manual

Signal Horns	5.3.6

(P-2/2)

Undercarriage Air Pressure Compressor 5.3.7

Description

The two air pressure compressors in the undercarriage supply the required air pressure during the operation in train formation to the air pressure brake system. The compressors are driven via a coupling. When the required air pressure has been reached, the line is opened and the air pressure compressors continue to run but without pressure. The compressors are fitted with an air cooling and a bath lubrication system.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly posted both in and out side the cab. Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Caution! Some sections of the system are not pressure less until the accumulators have been emptied!
Before work is carried out on the air pressure system, ensure the system is without pressure.
Caution!- Observe air pressure tank regulations!
Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.

Maintenance Instructions

1. Visual check:
   Check the air pressure compressors, their attachments and all connections for external damage and leakage. Check all connections and lines for firm seating.
2. To check the oil level:
   Note: The crane must be in horizontal position to check the oil.
   - Check the oil level via a dipstick (item 1); if required, top up the oil until it reaches the upper marking of the dipstick using the brand as classified in the chart in section 6 of this manual.
3 To change the oil:
   Note: The crane must be in horizontal position to change the oil.
   - Screw out the oil drain plug and drain oil.
   - Screw in the oil drain plug again and add oil as described in the section “ To check the oil level”
   - After a short trail run, check the oil level again.
4. Check the air filter (See left hand figure): if required, clean or replace a filter element.
5. Lubricate the lubrication nipple on the compressor shaft (see figure in the bottom centre and right.)

Undercarriage Air Pressure Compressor **5.3.7**

(P-2/2)

Pressure Regulator 5.3.8

Description

The pressure regulator maintains the operating pressure of the air pressure system at a constant pressure. It switches off at a pressure of 8.0 bar and switches on at 7.2 bar.

Safety Instructions

Before commencing with maintenance work, remove the battery main switch.
In addition, a “Maintenance Work” warning sign must be securely affixed here and in the cab.
If the diesel engine must be started for test purposes, ensure that no one is near moving or hot components - Danger of being crushed! Danger of being burnt!
Caution – ensure without fail that a “Maintenance Work” sign is posted in the cab during the test phase.
On completion of the test, shut off the crane without fail and secure accordingly. Use caution when dealing with the air pressure system! Work may only be carried out on when the system is without pressure and the diesel engine is at a standstill! This also applicable when air pressure connections are being tightened.
Caution- some sections of the system are not pressureless until the accumulators have been emptied.

Maintenance Instructions

1. Visual check:
   Check the pressure regulators and its pipe connections for external damage, firm seating and proper sealing.

2. Functional test:
   The switch-off pressure is attained when the pressure regulators can be heard to let off pressure; the switch-on pressure is attained when the indicator on the pressure gauge for the air reservoir begins to climb.

Pressure Regulator **5.3.8**

(P-2/2)

Railway Crane
Maintenance Manual

Diesel Engine System **5.4**

5.4.1 Diesel Engine
5.4.2 Exhaust System
5.4.3 Fuel System
5.4.4 Diesel Engine Accelerator
5.4.5 Pump Distributor Gearbox

Diesel Engine 5.4.1

Refer to Cummins Manual for Engine

Description

The diesel engine drives the hydraulic pumps for travel and crane operations via the pump distributor gearbox.
The diesel engine supply the air pressure via the attached air compressor to the air pressure system, the batteries with power via the attached 3 phase generator and thus also the electrical equipment with power.
The diesel engine is an air cooler 6 cylinder, 4-stroke diesel engine with direct fuel injection, exhaust turbo charger and charged cooling.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised stat.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system - Danger of explosion and fire!
Use caution when dealing with oil - danger of being burnt or scalded!
Caution - Hydraulic system work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary, This also applies to the tightening of hydraulic connections.
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Caution- air pressure system! Work may only be performed on the air pressure system when the diesel engine is not running and the entire air pressure system is without pressure. This is also applicable for the tightening of the air pressure connections.
Caution - sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill!
Ensure that no one is in the danger zone.
Observe the safety instructions provided in the Cummins User’s Manual.

Maintenance Instructions

The following maintenance work on the diesel engine system is to be carried out according to the information in the Cummins User’s Manual:
Please note: All the maintenance work listed in the interval beforehand must be carried out as well.

To carry out daily checks:

- Carry out a visual check.
- Check the oil level (See figure on the bottom left; if required top up oil using the brand as classified in the chart in section 6 of this manual.

- Check the coolant level. If required, top up coolant using the brand as classified in the chart in section 6 of this manual. In this case, the coolant concentration must be checked.

- Check the fan belt condition and tension; if required, re-adjust tension.

Weekly Checks:

- Check the pollution indicator on the air filter; if required, clean or replace filter element.
- Check the air intake hoses, pipes and clamps.

Monthly or every 125 hours: Change oil.

Note: The interval for changing the oil must be determined based on the Cummins User's Manual and the operating data recorded, i.e. average fuel and oil consumption or after an oil analysis.

See figure on the right for oil drain plug.

- Change fuel filter elements.
- Clean or change crank house ventilation.
- Change DCA coolant filter.

Semi-yearly or every 750 hours: Change oil filter elements.

Note: The interval for changing the oil must be determined based on the Cummins User's Manual and the operating data recorded, i.e., average fuel and oil consumption or after an oil analysis.

See figure on the right for oil drain plug.

- Change air compressor filter elements.

Yearly or every 1,500 hours:

- Check, clean and set the injection jets.
- Adjust piston cross heads.
- Adjust valves.
- Check hoses and lines; if required, change.
- Clean engine:
- Check cold start equipment.
- Check and tighten engine counting elements.
- Check crank shaft axial clearance.
- Check turbo charger mounting elements and screw conditions:

Every 2 years or every 3,000 hours:

- Clean and adjust fuel pump.
- Clean cooling system and change coolant.
- Check vent hub.

- Check idler pulleys.
- Check water pump.
- Check turbo charger.
- Check air compressor.
- Check the vibration damper.

Seasonal maintenance work (partial already mentioned above):

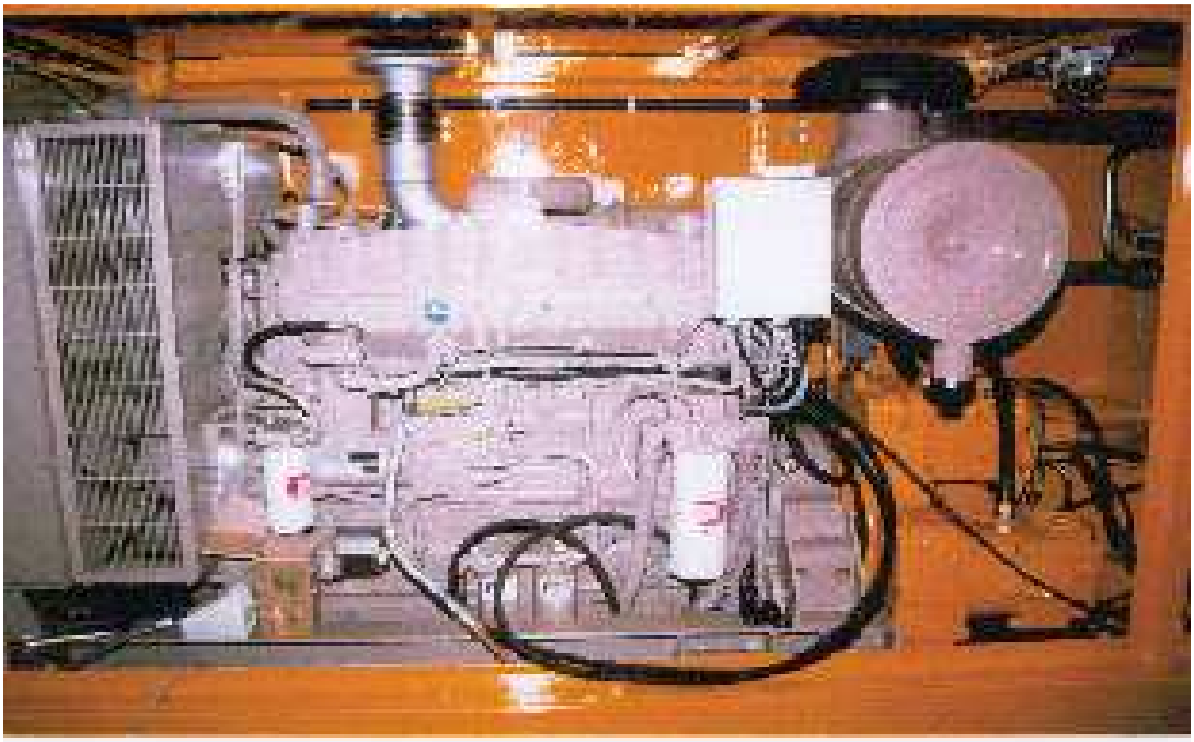
-Spring:

- Check hoses; if required, change.
- Clean engine
- Check mounting elements and screw conditions.
- Check turbo charger mounting elements on the fan and pulleys
- Check crank shaft clearance.

-Autumn:

- Check thermostats and seals.

Railway Crane
Maintenance Manual



Exhaust System 5.4.2

Description

The exhaust system emits the exhaust fumes into air, reduces the emission speed of the exhaust and silence the noise level of the diesel engine. The system consists of manifold, compensator and silencer.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed drawn in to the equipment! Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system - Danger of explosion and fire!
Ensure that no one is in the danger zone.

Maintenance Instructions

1. Visual check:
   Check the exhaust system, its connections and mountings elements for external damage and firm seating.

Railway Crane
Maintenance Manual

Fuel System 5.4.3

Description

The fuel system supply the fuel required to operate the diesel engine. The fuel capacity is 900 litres. The system is fitted with an electric indicator.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system - Danger of explosion and fire!
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Ensure that no one is in the danger zone.

Maintenance Instructions

1. Visual check:
   Check the fuel system, its pipe and hoses connections for external damage, firm seating and leakages. Any damaged fuel lines must be replaced immediately. Also check the connections on the electric indicator for firm seating.

2. Tank Cover:
   The tank has a filler neck on the superstructure. Check the tank cover for proper functioning. A faulty tank cover must be replaced.

3. Condensation drain:
   To avoid corrosion damage, drain the condensation via the drain plug on the tank under side. To do so, open the plug until clean diesel fuel emerges. When re-closing, ensure the seal is seated properly!

   Caution- Observe your country’s disposal regulations!

Railway Crane
Maintenance Manual

Diesel Engine Accelerator 5.4.4

Description

The accelerator controls the injection pump of the engine. The accelerator is operated via a Bowden cable by means of a pedal in the cab.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system - Danger of explosion and fire!
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Ensure that no one is in the danger zone.
Observe the safety instructions provided in the Cummins User’s Manual.

Maintenance Instructions

1. Visual check:
   Check the accelerator and the pertaining linkage including Bowden cable for external damage and firm seating.

2. Functional Test:
   Start the diesel engine for the functional test and operate the gas pedal in the cab. Check whether the diesel engine runs evenly in the various speed ranges.

Diesel Engine Accelerator **5.4.4**

(P-2/2)

Pump Distributor Gearbox 5.4.5

Description

The pump distributor gearbox is flanged-mounted on the diesel engine and transfers the drive output of the diesel engine to the pump distributor gearbox flanged-mounted on the hydraulic pump. The pump distributor gearbox is a spur gear seated on a roller bearing and fitted with an oil bath lubrication system.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised stat.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system - Danger of explosion and fire!
Use caution when dealing with hot oil - danger of being burnt or scalded!

Maintenance Instructions

The following maintenance work on the diesel engine system must be carried out according to the information in the Lohmann and Stolterfoht User’s Manual.

1. Visual check:
   Check the pump distributor gearbox, in particular, near the flange connections for external damage, leakages and firm seating.

2. Check the running noises:

3. Check the oil level:
   Note: To check the oil level of the distributor box, the railway crane must be in horizontal position. Switch off the engine when it has reached operating temperature and wait approx 10 minutes to check the oil level.
   - Pull out the oil dipstick (item 2) of the pump distributor gearbox.
   - The oil level must be between the upper and lower markings of the dipstick; if required top up oil using the brand as classified in the chart in section 6 of this manual.

   Note: Add or top up oil via the filler opening (item 1), the plug of which is screwed out for this purpose. The screw in the plug and tighten.

4. Carry out an oil analysis:
   An oil analysis should be carried out every 750 operating hours to test the oil quality. If required, adjust the oil changing intervals.

5. To change the oil:
   Note: To change the oil of the distributor gearbox, the crane must be in horizontal position. Switch off the engine when it has reached operating temperature and wait approx 10 minutes to check the oil level.
   - To drain the oil, screw out the oil drain plug on the gearbox under side and collect the waste oil in a suitable and sufficiently large enough pan.
   - Flush the gearbox with flushing oil.
   - Clean the magnet plug on the oil drain plug, screw in and tighten according to regulations.
   - To carry out an oil analysis: if there is considerable metal abrasion in the oil or the drain plug, this means that there is high degree of wear or considerable gearbox damage. If required, consider a gearbox inspection.
   - Top up oil as per the classification in the chart until the upper marking on the dipstick is reached.
   - To add or top up on, observe the information in the section on the oil level check.

6. Check the vent filter on the housing upper side; if required, clean or replace.

7. Check the screw-on connection for firm seating, taking into account the torque on the installation drawing.

5.5.1 Emergency Diesel Engine

Emergency Diesel Engine 5.5.1

Description

The emergency diesel engine drives a hydraulic pump and a 3-phase generator in emergency operation. It can be started electrically and manually. The 2-cylinder, 4-stroke diesel engine has a capacity of 1884 cm^3 and an output of 16.9 kW at 1,800 rpm.

Safety Instructions

Caution - fuel is inflammable! When working near fuel related parts, fire, naked light and smoking are prohibited!
Caution - Lubrication oil, etc. are drained at operating temperature - danger of scalding!
Caution - Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution - air pressure system! Work may only be performed on the air pressure system when the diesel engine is not running and the entire air pressure system is without pressure. This is also applicable for the tightening of the air pressure connections.
Caution! sections of the air pressure systems are under pressure until the accumulators have been emptied.
Prior to commencing work, remove the battery main switch. In addition, a "Maintenance Work" warning sign must be affixed here and in the cab. When work is being performed in the cab, ensure that the switches and levers are not operated by accident or unknowingly.
Ensure that no one is in the danger zone.
Observe the safety regulations in the Kirloskar User's Manual:

Maintenance Instructions

The following maintenance work on the diesel engine must be carried out according to the information provided in the Kirloskar User's Manual.

1. Visual check:
   Check the emergency diesel engine, its attachments and connections for external damage and leakages. Check all connections and lines for firm seating.

2. To check the oil level:
   Note: To check the oil level the crane must be in horizontal position.
   - Switch off the engine when it has reached operating temperature and wait until the oil has run back into the oil tray.
   - To check the oil level, pull out the oil dipstick and wipe off with a clean, lint-free rag. Then insert the oil dipstick and pull out again. The oil level must between upper and lower markings of the dipstick (see figure at the bottom). If required, top up with oil using the brand as classified in the chart in section 6 of this manual.

3. To change the oil:
   Note: To change the oil, the crane must be in horizontal position. The oil should be changed when the oil is at operating temperature.
   - Switch off engine.
   - Screw out the oil drain plug on the bath and drain the waste oil into a sufficiently large enough collection tray (approx. 4.5 l). Then screw in the drain plug with a new seal tightly.
   - Then top up oil via oil filler neck using the brand as classified in the chart in section 6 of this manual until the oil level is between the upper and lower markings on the dipstick.

4. Replace the lubrication oil filter.
5. Clean fuel screen.
6. Check the oil level of the fuel pump.
7. Air filter:
   - Clean or replace preliminary filter
   - Clean or replace oil bath-type air filter and re-fill.
8. Check the exhaust system and clean.
9. Check the fan belt tensioning: if required, re-adjust.
10. Replace the fuel preliminary filter element.
11. Replace fine filter element.
12. Check mounting elements.
13. Check starter and generator.
14. Check valve clearance: if required: Re-adjust.
15. Check injection jets.
16. Carry out a functional test.

Railway Crane
Maintenance Manual

Emergency Diesel Engine	**5.5.1**

(P-3/3)

Railway Crane
Maintenance Manual

Travel and Running Gear **5.6**

((P-1/1))

5.6.1 Travel Reduction Gear Unit
5.6.2 Pinion and Gearwheel
5.6.3 Disengaging Devices
5.6.4 Wheel Sets
5.6.5 Wheel Set Bearings
5.6.6 Spring Suspension
5.6.7 Expander-Operated Brake Disks
5.6.8 Brake Cylinder Adjuster Units
5.6.9 Brake System

Travel Reduction Gear Unit 5.6.1

Description

The travel gear reduction unit reduces the drive speed of the hydraulic motor is the required pinion speed. The crane has a total of two travel drives and thus two travel gear reduction units.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment.
Caution - When dealing with hot oil- Danger of being burnt or scalded!
Caution - Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary. This also applies to the tightening of hydraulic connections. Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution! - Some sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.

Maintenance Instructions

1. Visual check:
   Check the travel gear reduction units for external damage, leakages and firm seating.

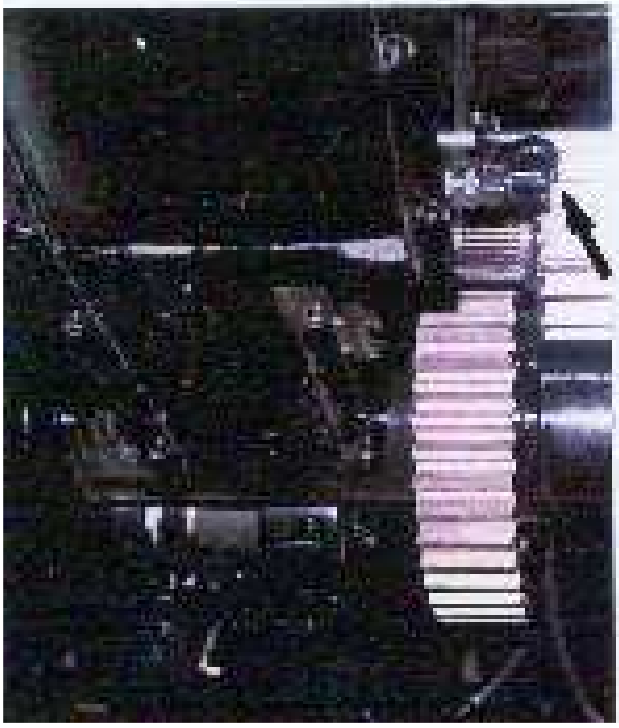
2. To check the oil level:
   Note: To check the oil level, bring the railway crane into horizontal position and switch off the engine at operating temperature.
   - The oil level is checked via an overflow gauge.
   - To do so, clean the exterior of the oil filter plug (see figure on the bottom left) and screw out.
   - If required, add oil until the oil level remains constant.
   - Screw in the oil filter plug and tighten.
3. To change the oil:
   To change the oil, the railway crane must be in a horizontal position and switch off the engine at operating temperature.
   - The oil must be changed at operating temperature.
   - Screw out the oil filter plug and the oil drain plug (see figure at the top, item 1) and drain the oil completely.
   - Check drained oil for metallic pollution and excessive abrasion.
   - In the event of considerable oil pollution, the gear unit must be fitted with preheated oil.

- Then tighten the oil drain plug using a new sealing ring.
- Add oil until the oil level remains constant.
- Screw in the oil filter plug and tighten

2. Clean the gear unit exterior.

3. To check the vent:
   - If the vent is seriously clogged, screw out the vent (figure on the bottom right, item 2) from the gear unit, wash in a suitable solution and dry with compressed air.

1



2

Pinion and Gear Wheel 5.6.2

Description

The pinion and gear wheel on the wheel shafts forms the last stage of the disengageable travel gear drive. The crane has a total of two travel drives and thus two pinion and gear wheels.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
Caution - When dealing with hot oil- Danger of being burnt or scalded!
Observe disposal regulations!

Maintenance Instructions

1. Visual Check:
   Check the pinions and gear wheels for external damage.

2. To clean:
   Clean the pinion and gear wheels with a suitable aid.

3. To grease:
   Caution - Grease using the lubrication brand as per the chart in the section 6 of this manual.

Disengaging Devices 5.6.3

Description

By means of the disengaging device, the pinion and the gear wheel of the travel drive are disengaged prior to transport. The disengaging device is actuated via an air pressure cylinder. The crane has a total of two travel drives and thus two disengaging devices.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment.
Caution - When dealing with hot oil - Danger of being burnt or scalded!
Observe disposal regulations!
Caution - Some sections of the system are under pressure until the accumulators have been emptied.
Prior to commencing work on the air pressure system, ensure the system is completely without pressure!
Use caution when dealing with air pressure system! Work may only be performed on the air pressure is without pressure. This is also applicable for the tightening of the air pressure connections.

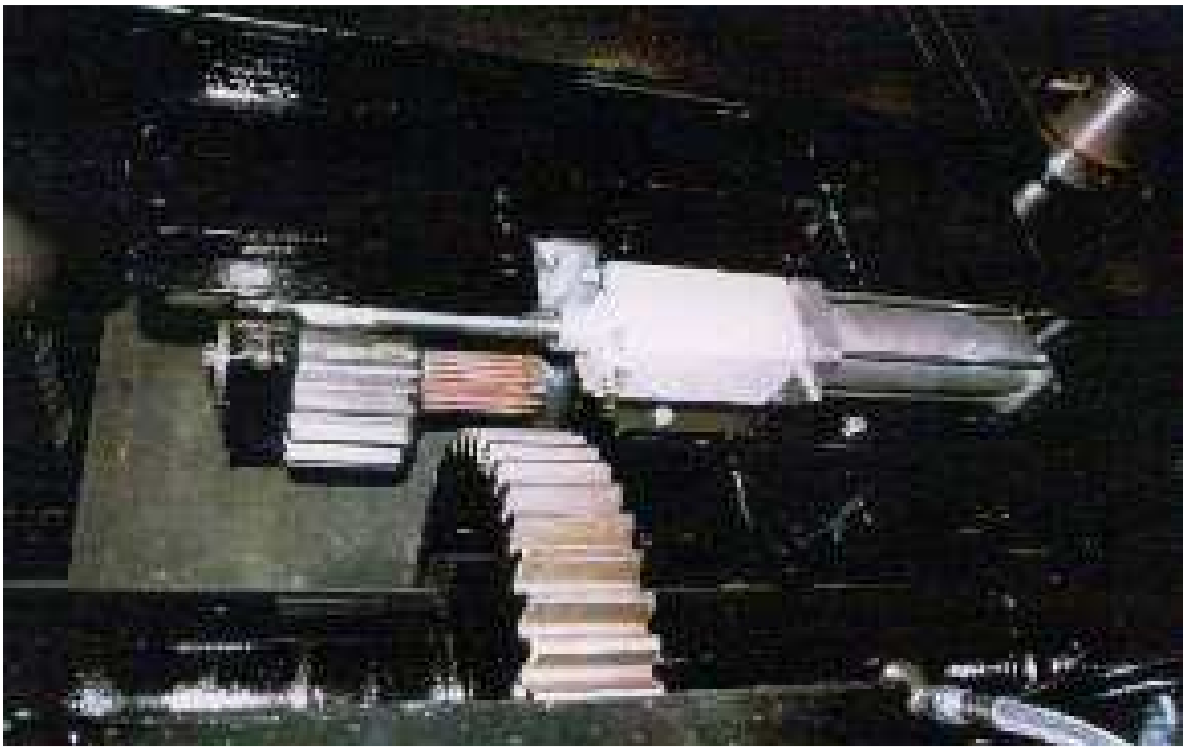
Maintenance Instructions

1. Visual check:
   Check the disengaging devices, their connections and mountings for external damage and firm seating.

2. Air pressure cylinders:
   - Check the air pressure cylinders, their connections and mountings for external damage, firm seating and proper sealing.
   - Tighten and replace loose and leaky connections when the system is not under pressure.
   - On completion of the maintenance work, a seating test under pressure must be carried out.

3. To check the spline shaft teething.
   Check the spline shaft teething for dirt; if required, clean. Then grease.

4 Functional Test:
   Check the disengaging devices for proper functioning.



Wheel Sets 5.6.4

Description

The six wheel sets are specially manufactured sets, which are suited to absorbing all the forces and stresses which occur during crane and travel operation.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment.
Caution - when dealing with hot oil- Danger of being burnt or scalded!
Observe disposal regulations!

Maintenance Instruction

The following maintenance work on the wheel sets must be carried out according to the information in the Gutehoffnungshutte Radsatz GmbH User’s Manual.

1. Visual check:
   Check the wheel sets for cracks, fractures and damage. Watch for the following features. If required, repair or replace:
   - Cracks in the hub or disk of the solid wheels
   - Indicating groove on the solid wheels are no longer visible on the circumference.
   - Shape and location of the wheel contours.
   - Surface finish of wheel treads
   - Broken or cracked wheel rims on the solid wheels
   - Wheel flats on the wheel tread
   - Heat cracks in the disk wheels
   - Clamping nicks on the solid wheels
   - Spalling on the wheel treads
   - Wheel shift
   - Cracks in the wheel axles
   - Deformed wheel axles
   - Heavy rusting on axles and disk wheels
2. Mountings:
   Check the mountings of the brake disks for proper and firm seating.
3. Wheel brake-to back distance:
   The wheel back-to-back distance (crane unloaded): 1596mm-2mm
4. Diameter difference between the rolling circle diameters:
   The difference between the rolling circle diameters of the finished wheels of a wheel set must be within a tolerance range of 0.3 mm.
5. Wear test / Operating limit size:
   Rolling circle diameter, **new** 920mm $\pm$ 1 mm
   Rolling circle diameter**, min**: 840 mm

Wheel Set Bearings 5.6.5

Description

The wheel set bearings are anti-friction bearings with a grease filling.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
Caution - When dealing with hot oil- Danger of being burnt or scalded!
Observe disposal regulations!

Maintenance Instructions

1. Visual check:
   Check the wheel set bearings and their guides for external damage.

2. Grease Filling:
   The bearings have grease filling. To replace the filling, open the bearing and remove the bearing housing. Then clean the entire anti-friction bearing and the housing and filled with fresh grease. Re-assembly in reverse order.
   Note: The inner bearings should not be opened.

Railway Crane
Maintenance Manual

Wheel Set bearings	**5.6.5**

Spring Suspension 5.6.6

Description

To provide optimal suspension, the crane is fitted with a spring system. The system consists of a combination of cup springs (see right hand figure) and the helical springs (see left hand figure). In crane operation, the spring suspension clearance is blocked during crane operation by means of hydraulic cylinders.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment.
Caution - When dealing with hot oil- Danger of being burnt or scalded!
Observe disposal regulations!

Maintenance Instructions

1. Visual check:
   Check the components of the spring assembly for external damage as well as for cracks and fractures. Any damaged spring elements must be replaced immediately.

2. To clean:
   If required, clean spring suspension with a suitable aid.

Brake Disks 5.6.7

Description

The brake disks in connections the brake cylinder adjuster unit and the brake cylinders form the wheel disk brakes. These wheel brake disks are used as the service brakes. The brake disks are mounted on the wheels of the wheel set axles.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Caution - The brake disks must be cooled down - Danger of injury through burns as a result of contact with the brake disks!
When the following work is performed on the brake disks, observe the safety instructions in the BSI Verkehrstechnik User’s Manual.
The brake disks may first be used again when all the criteria in the BSI-Verkehrstechnik User’s Manual have been met.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

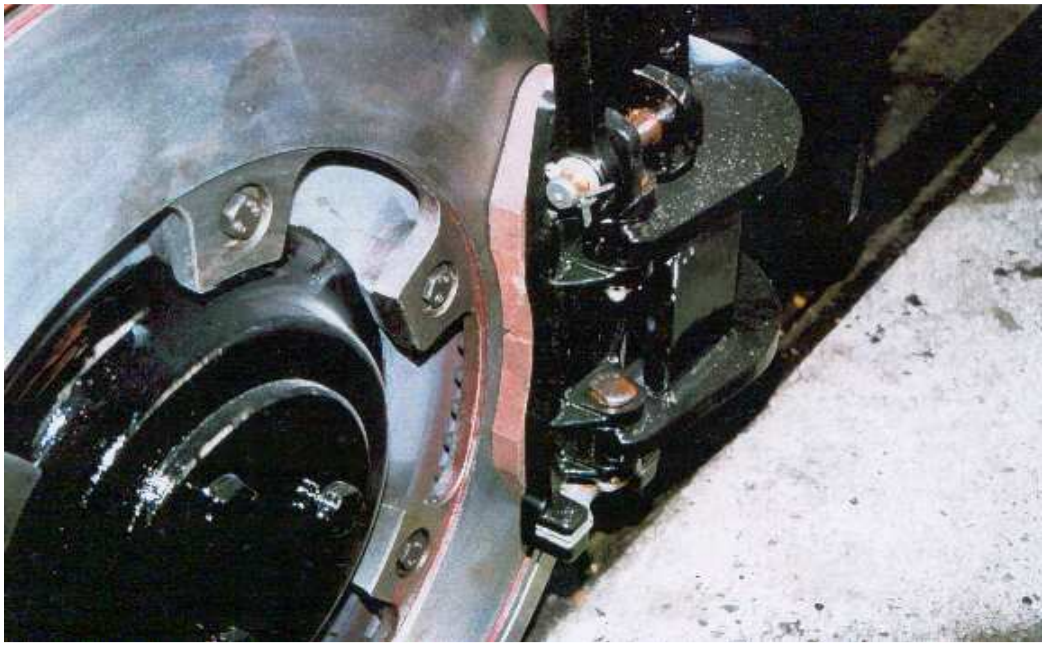
Maintenance Instructions

The following maintenance work on the brake disk must be carried out in accordance with the instructions in the BSI- Verkehrstechnik User’s Manual:

1. Visual Check (Inspection A)
   - Check the brake disks for external damage, cracks, (great thermal shock cracks) and fractures:
   - In addition, when the wear markings on the disks have been reached (see figure at the top) check the pads (see figure at the bottom) and the clearance:
     Wear markings:
     Disk wear limit : max. 7.0 mm
     Hollow wear : max. 2.5 mm
     Grooves : max. 1 mm

2. Carry out a functional test (brake test) (Inspection A)
3. Inspection B
4. Inspection C
5. Inspection D

Brake Disks	**5.6.7**



Brake Cylinder Adjuster Units 5.6.8

Description

The brake cylinder adjuster unit, together with the built-in brake cylinder, forms in connection with the wheel-mounted brake disk, the wheel disk brake of the railway crane. This brake is used as the service brake.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Caution! The brake disks must be cooled down - Danger of injury through burns as a result of contact with the brake disks!
When the following work is performed on the brake disks, observe the safety instructions in the BSI Verkehrstechnik User’s Manual.
The brake cylinder adjuster unit may first be used again when all the criteria in the BSI-Verkehrstechnik User’s Manual have been met.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

The following maintenance work on the brake disk must be carried out in accordance with the instructions in the BSI- Verkehrstechnik User’s Manual.

1. Visual Check (Inspection A):
   - Check the brake cylinder, adjust units for external damage.
   - In addition, check the clearance when the wear markings on the pads have been reached:
     - Wear markings (Brake Pads):
       New Condition : 24 mm
       Wear limit : 6 mm
     - Longitudinal clearance of the pad holder: max: 2 mm
     - Clearance for the brake pads and brake disks
       - Pads on the expander unit: max. 2 mm
       - Pads on the other side: max. 4 mm
2. Carry out a functional test (Brake test) (Inspection A)
3. Inspection B
4. Inspection C
5. Inspection D

Railway Crane
Maintenance Manual

Brake Cylinder Adjuster Units	**5.6.8**

(P-2/2)

Brake System 5.6.9

Description

The crane can either be operated by means of an air pressure brake system or a vacuum brake system. The brake system can be changed from the air pressure system to the vacuum system and vice versa means of two levers which can be operated on both sides of the crane.
The status of the brakes can be read off the respective indicators (red and green).
If required, the spring-loaded cylinders of the brakes can be relieved of pressure by means of the cables on the axles.
Caution! In this case, braking cannot be carried out again until the brake system has been re-pressurised with air pressure.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed both in and outside the cab.
Remove the ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of together vehicles.
Caution - The brake disks must be cooled down - Danger of injury through burns as a result of contact with the brake disks!
When the following work is performed on the brake disks, observe the safety instructions in the BSI Verkehrstechnik User’s Manual.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!
Caution! On activation of the Bowden cables, braking cannot be carried out again until the brake system has been re-pressurised with air pressure.

Maintenance Instructions

1. Visual check:
   Check all the components of the brake system, in particular the change- over devices and the Bowden cables as well as their pertaining mountings for external damage and firm seating. Also check the indicators for firm seating.

2. To clean:
   Clean the change- over devices and the Bowden cables.

3. To check the emergency release device;
   Check the six pull cables of the emergency release device for proper functioning.

4. Functional test:
   Carry out a functional test on the entire brake system. The brakes must be operated and then released. Observe the indicators during this procedure

Railway Crane
Maintenance Manual

Cab **5.7**

(P-1/1)

5.71 Cab
5.7.2 Control Panels
5.7.3 Screen Wash / Wiper System
5.7.4 Fan
5.7.5 Seat
5.7.6 Additional Equipment

Cab 5.7.1

Description

The cab protects the operating personnel and the sensitive controls against the influences of weather.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame - use caution- danger of explosion near fuel and oil related components!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger zone.

Maintenance instructions

1. Visual check:
   - Check the entire cab for external damage and deformations. Caution: Check material before commencing with straightening work! In some cases, the cab has aluminium profile which must not be heated by flame.
   - Check the glass for damage. Any damaged panels must be replaced immediately.

2. To clean:
   Clean the cab with a suitable aid. This applies, in particular to the walkways and stair areas; oily and greasy components increase the danger of slipping!

3. Doors:
   Clean, grease and check the hinges and door lock for proper functioning.

4. Paintwork damage:
   - Clean the paintwork damage immediately and protect against corrosion with primer and paint.
   - Priming: epoxyd resin 2- component priming
   - Top coat: 2- component polyurethane high- solid material

Railway Crane
Maintenance Manual

Cab	5.7.1

(P-2/2)

Control Panels 5.7.2

Description

By means of the control panels, all crane and travel motions can be affected and most functions can be monitored.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger zone.

Maintenance instructions

1. Visual check:
   Check the control panels for external damage and firm seating. Damaged components must be replaced immediately.

2. To clean:
   Clean the control panels with a suitable aid. Ensure that water and other wet - cleaning agents cannot damage the sensitive electrical components.

Railway Crane
Maintenance Manual

Control Panels	5.7.2

(P-2/2)

Screen Wiper/ Wash system 5.7.3

Description

The crane has an electrically operated wiper system with wash water system on its front (see figure at the top) and roof windscreens. The wash system is likewise operated by means of an electric pump.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger zone.

Maintenance instructions

1. Visual check:
   Check the entire system for external damage and firm seating. In addition, check the hoses of the wash system and their connections for proper sealing. In particular, ensure the wiper blades are in good condition. Any damaged or worn wiper blades must be replaced immediately.

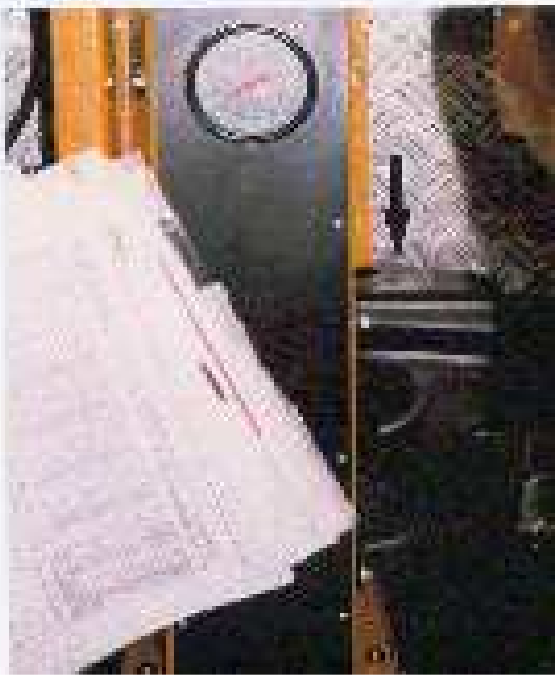
2. Wash water:
   Check the wash water supply (see bottom right hand figure) and if required, top up. It is advisable to add a corresponding anti-grease cleaning agent to the water. Caution- remember to add anti-freeze in the cold season!

3. Functional test:
   Check the system for proper functioning.
   Caution: - When the diesel engine is at a standstill, the screen wipers should only be switched on momentarily as other the batteries will run flat and the charged status will not be sufficient to start the diesel engine.

Railway Crane
Maintenance Manual

Screen Wiper/ Wash system	5.7.3

(P-2/2)



Fan 5.7.4

Description

The fans built into the cab rear wall at the top serve to suction off and intake the cab air.

Safety Instructions

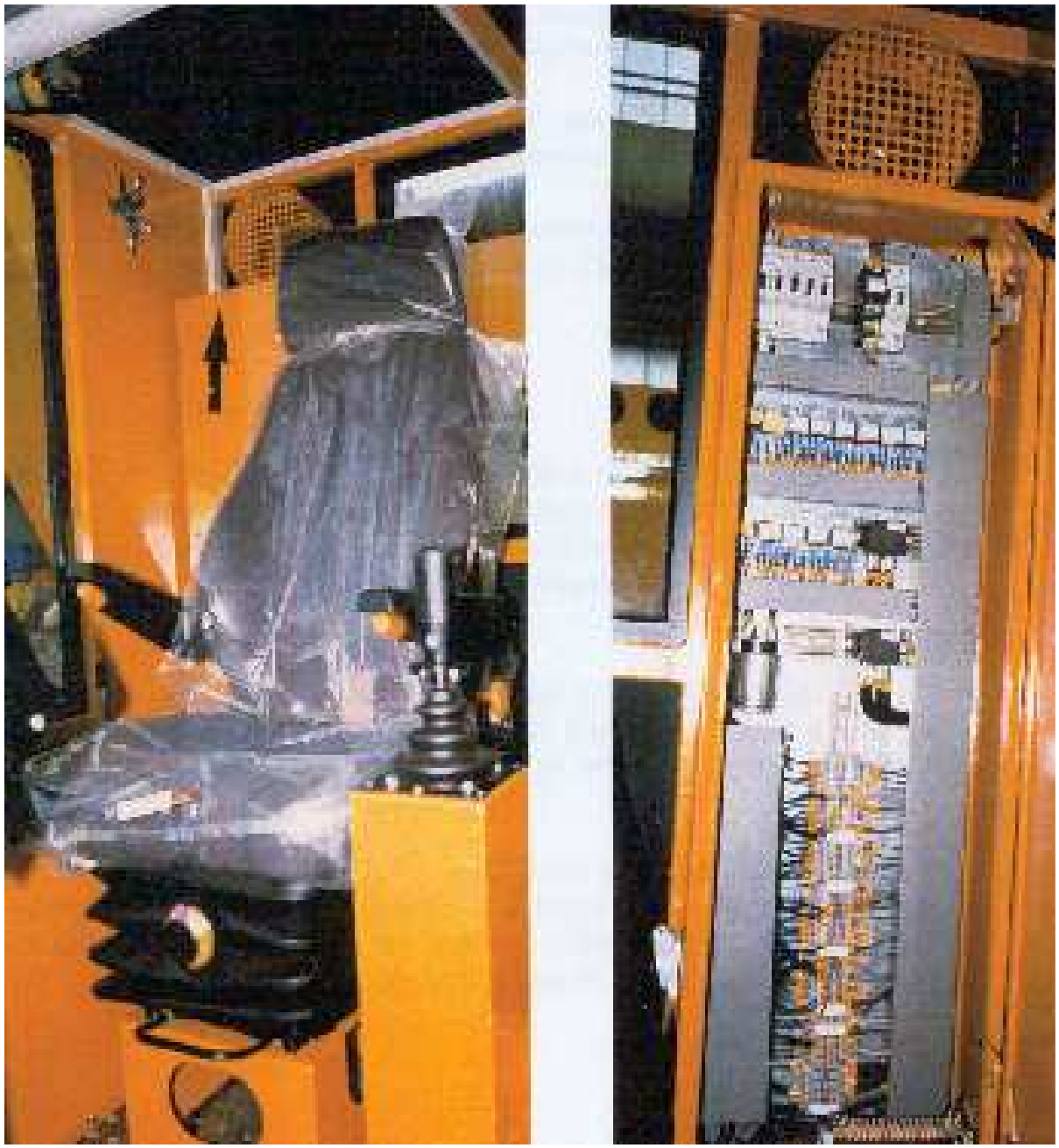
Before maintenance work is performed, it must be ensured that the crane can not be switched on and secured against rolling.
In addition, a “maintenance Work” warning sign must be visibly affixed to both in and out side the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger getting burnt, crushed or drawn into the equipment.
The crane must not be operated in enclosed areas without an exhaust fumes discharge.
When work is being performed on the crane, ensure that the switches levers can not be operated by accident or unknowingly. Ensure that no one is in the danger zone.

Maintenance Instructions

1. Visual check:
   Check the fans and their cover grates for external damage and firm seating.

2. To clean:
   Screw off the vent grates when the fans are switched off and clean with a suitable aid.

3. Functional test:
   Activate the respective switch on the control panel and test whether both fans run properly.
   Caution! When the diesel engine is stationary, the fans should run only shortly as otherwise the batteries will run flat and the charging rate will not be sufficient to start the diesel engine!



Seat 5.7.5

Description

The driver seat is a comfortable seat with a number of adjusting options.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger zone.

Maintenance instructions

1. Visual check:
   Check the entire seat and its controls and mountings for external damage and firm seating.

2. Slide tracks:
   Clean the slide tracks, on which the movable seat is fixed, with a suitable aid and grease slightly.

Additional Equipment 5.7.6

Description

There are various pieces of additional equipment on the crane, in particular, in the cab. Nevertheless, they do not serve to effect any crane functions directly, but are required for smooth- running and proper operation.

Safety Instructions

When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly. Ensure that no one is in the danger zone!

Maintenance instructions

Check the entire cab equipment for proper functioning.
Any damaged parts must be repaired or replaced.
Caution - Remember that fire extinguishers and first aid kits, etc. have expiry dates. Then they must be serviced or replaced accordingly!

Railway Crane
Maintenance Manual

Railway Crane
Maintenance Manual

Slewing Gear **5.8**

(P-1/1)

5.8.1 Slew Reduction Gear Unit
5.8.2 Pinion and Gearwheel
5.8.3 Roller Bearing Slew Ring

Slew Reduction Gear Unit 5.8.1

Description

The slewing gear reduction unit (see figure at the top) is a three-stage planetary gearbox. The equipment consists of an integrated, hydraulically lifted multi-disk holding brake with free-wheeling option.
The wheels with external toothing have been hardened. The entire gearbox is seated on an anti-friction bearing and is fitted with an oil bath lubrication system. The bearing of the drive pinion in the stay pipe is lubricated continuously with grease.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

Carry out the maintenance work on the planetary gearbox according to documentation supplied by Lohmann & Stolterfoht GmbH.

1. Visual check:
   Check the planetary gearbox, its attachments and connections for damage and leakages. Check for all connections, lines and connections for firm seating.

2. Carry out a running noises check.

3. To check the oil level:
   Note: The crane must be in horizontal position to check the oil level.
   - Screw out the oil dipstick and wipe off with a clean, lint-free cloth. Then screw in the oil dipstick and then screw out again. The oil level must be between the upper and lowering markings on the dipstick (see figure at the bottom); if required, top up the oil using the brand as classified in the chart in section 6 of this manual via the oil dipstick opening.
   - Then screw in the oil dipstick.

4. To carry out an oil analysis:
   Carry out an oil analysis according to the intervals laid down in the maintenance check list.

5. To change the oil:
   Note: The crane must be in horizontal position to charge the oil level.
   - The oil must be changed when the oil has reached operating temperature.
   - Direct the hose for the oil drain (below the slew reduction gear unit) into an external outlet.

- Screw out the oil dipstick and the oil drain plug on the hose end (see figure at the bottom).Drain the oil into a suitable and sufficiently large enough tray (oil quantity: approx. 15.5 litters). Always check the drained oil for metal pollution and excessive abrasion.
- Screw out the oil drain plug on the hose end and direct the hose back into the opening.
- Add oil using the brand as classified in the chart in section 6 of this manual. Monitor the oil level via the oil dipstick.
- Wait a few minutes.
- If the oil level falls, top up the oil until the oil level maintains constant.
- Then screw in the oil dipstick.

6. To check the screw connections:
   Check the screw connections, taking into the account the torque moment in the installation drawing and check for firm seating.

7. Breather filter:
   Unscrew the breather filter adjacent to the pipe whenever oil is topped up and check for pollution; if required, clean or replace the filter.

Pinion and Gearwheel 5.8.2

Description

The pinion and gear wheel forms the last stage of the slewing gear drive. The pinion and gear wheel must be checked regularly for damage and lubricated according to the maintenance check lilt for damage.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!
To check and clean the pinion and gear wheel, the superstructure must be rotated several times on the undercarriage.
Prior to commencing with the actual work, ensure, using the above measures that the crane cannot be set into operation- danger of being crushed or drawn into the equipment!

Maintenance instructions

1. Visual check:
   Check the gear wheel and, in particular, the pinion for external damage such as cracks, broken teeth, dimples and steel pits.

2. To clean and grease:
   Clean the gear wheel and pinion of waste grease and dirt. Then grease with spray grease brand as classified in the chart in section 6 of this manual.

Railway Crane
Maintenance Manual

Pinion and Gearwheel	**5.8.2**

(P-2/2)

Roller Bearing Slew Ring 5.8.3

Description

The roller bearing slew ring is the 360^0 rotatable connection between the superstructure and the undercarriage.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts-danger of getting burnt, crushed or drawn in to the equipment!
To carry out the running noises check, the superstructure must be rotated several times on the undercarriage.
Prior to commencing with the actual work, ensure, using the above measures, that the crane cannot be set into operation - danger of being crushed or drawn into the equipment!

Maintenance instructions

1. To carry out the running noises check:
   To carry out the running noises check, the superstructure must be rotated slowly on the undercarriage; ensure that the bearing assembly runs smoothly and quaintly.

2. To lubricate:
   Two lubrication nipples are located in the left machinery house near the slew reduction gear unit. The entire slew ring must be lubricated via these nipples. The grease is fed via a pipeline system to the 24 lubrication points. These points must be lubricated until the slew ring is protected by means of a clean, surrounding bead of grease.

3. Check the bolt-type connections:
   To compensate for settling, the bolts must be tightening with the prescribed torque moment.

Railway Crane
Maintenance Manual

Roller Bearing Slew Ring	**5.8.3**

Main Hoist **5.9**

(P-1/1)

5.9.1 Main Hoist Reduction Gear Unit including Brake
5.9.2 Rope Drum

Main Hoist Reduction Gear Unit including Brake 5.9.1

Description

The main hoist is a three – stage planetary gearbox. The equipment includes an integrated, hydraulically lifted multi-disk brake with free-wheeling option and a counter bearing.

The wheels with external toothing have been hardened. The entire gearbox is seated on anti-friction bearing and is fitted with an oil bath lubrication system. Power take-off and drive motions have counter rotary directions.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.

In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.

Remove ignition key and battery main switch and secure against any unauthorised start.

The crane must not be in the way of other vehicles.

Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

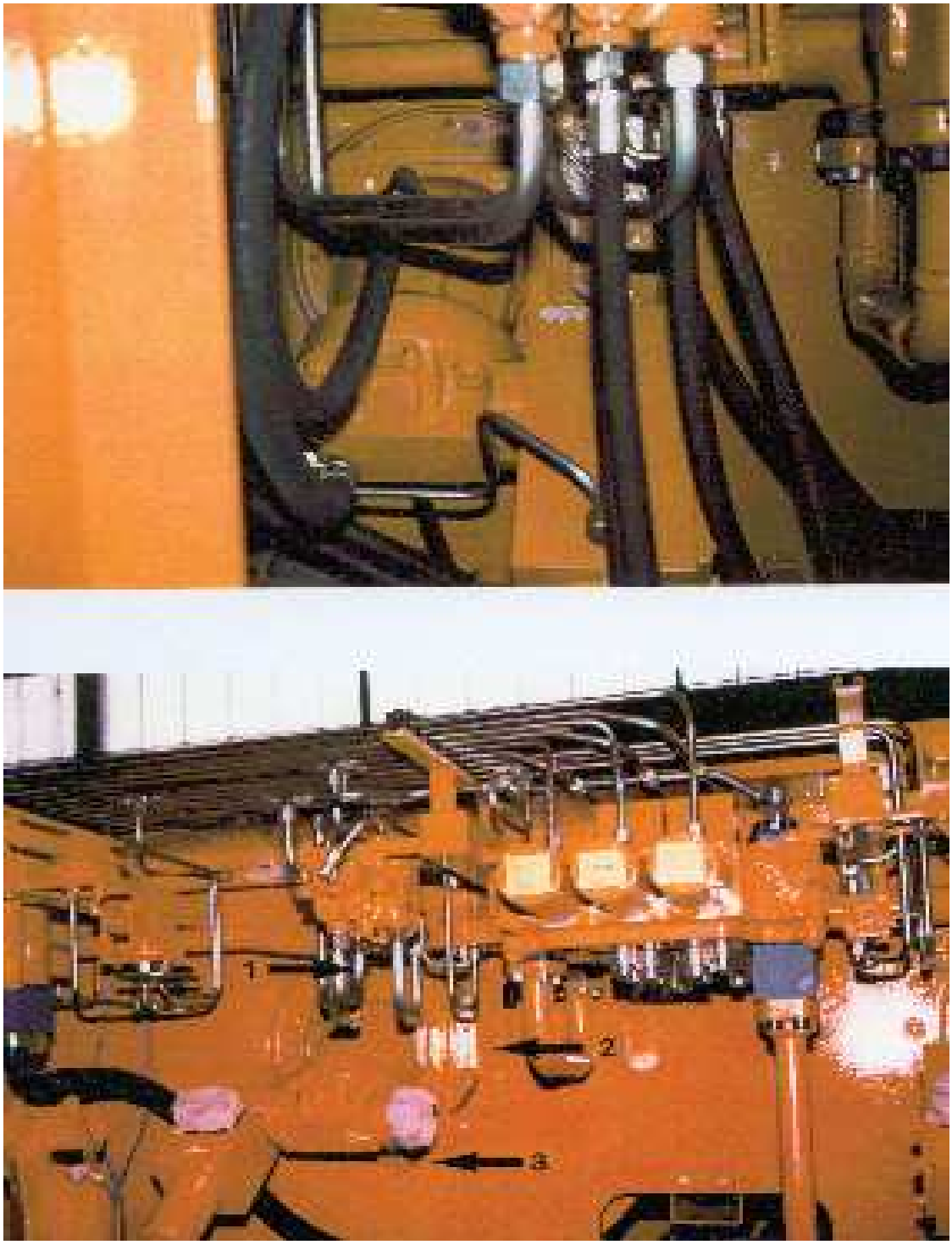
Maintenance Instructions

The maintenance work on the planetary gearbox must be carried out according to the information in the Lohmann & Stolterfoht GmbH User’s Manual.

1. Visual check:
   Check the planetary gearbox, its attachments and all connections for external damage and leakages. Check all connections, lines and links for firm seating.
2. Carry out a running noise check.
3. To check the oil level:
   Note: The crane must be in horizontal position to check the oil level.
   - The oil is checked via the overflow meter. To do so, screw out the oil filter plug (item 1) and the oil level inspection plug (item 2); if required, top up oil using the brand as classified in the chart in section 6 of this manual.
   - Then screw in both plugs.
4. To carry out an oil analysis:
   Carry out an oil analysis according to the intervals in the maintenance check list.
5. Lubricate the lubrication nipple on the counter bearing.
6. To change the oil:
   Note: The crane must be in horizontal position to change the oil.
   - The oil must be changed when the oil has reached operating temperature.
   - Screw out the oil filler plug, the oil level inspection plug and the oil drain plug (item 3) and allow the oil to drain in a suitable and sufficiently large enough tray (approx. 6.5 L) oil. Always check the drained oil for metallic pollution and excessive abrasion.

- Then screw in the oil drain plug and add oil through the opening using the brand as classified in the chart in section 6 of this manual. Monitor the oil level on the oil level inspection plug.
- Wait a few minutes.
- If the oil level falls, top up the oil until the oil level maintains constant.
- Then screw in the oil filler plug and the oil level inspection plug

7. To check the screw connection:
   Check the screw connections taking into the account the torque moment in the installation drawing and check for firm seating.


1
2
3

Rope Drum 5.9.2

Description

The rope drum forms a rigid unit with the main hoist reduction unit. The rope drum coils the hoist rope in several layers.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

1. Visual check:
   Check the rope drum for external damage and firm seating

2. Rope clamp:
   Check the rope clamp for firm seating and damage.

Railway Crane
Maintenance Manual

Auxiliary Hoist **5.10**

(P-1/1)

5.10.1 Auxiliary Hoist Reduction Gear Unit including Brake.
5.10.2 Rope Drum

Auxiliary Hoist Reduction Gear Unit including Brake 5.10.1

Description

The auxiliary hoist is a two-stage planetary gearbox. The equipment includes an integrated, hydraulically lifted multi-disk brake with free - wheeling option and a counter bearing.
The wheels with external toothing have been hardened. The entire gearbox is seated on an anti-friction bearing and is fitted with an oil bath lubrication system.
Power take-off and drive motions have counter rotary directions.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts-danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

The maintenance work in the planetary gearbox must be carried out according to the information in the Lohmann & stolterfoht GmbH User’s Manual.

1. Visual check:
   Check the planetary gearbox, its attachments and all connections for external damage and leakages. Check all connections, lines and links for firm seating.
2. Carry out a running noise check
3. To check the oil level:
   Note: The crane must be in horizontal position to heck the oil level.
   - The oil is checked via the overflow meter. To do so, screw out the oil filter plug (item 1) and the oil level inspection plug (item 2); if required, top up oil using the brand as classified in the chart in section 6 of this manual.
   - Then screw in both plugs.
4. To carry out an oil analysis:
   Carry out an oil analysis according to the intervals in the maintenance check list.
5. Lubricate the lubrication nipple on the counter bearing.
6. To change the oil:
   Note: The crane must be in horizontal position to change the oil.
   - The oil must be changed when the oil has reached operating temperature.
   - Screw out the oil filler plug, the oil level inspection plug and the oil drain plug (item 3) and allow the oil to drain in a suitable and sufficiently large enough tray (approx.3.5 L) oil. Always check the drained oil for metallic pollution and excessive abrasion.

- Then screw in the oil drain plug and add oil through the opening using the brand as classified in the chart in section 6 of this manual. Monitor the oil level on the oil level inspection plug.
- Wait a few minutes.
- If the oil level falls, top up the oil until the oil level maintains constant.
- Then screw in the oil filler plug and the oil level inspection plug.

7. To check the screw connections:
   Check the screw connections taking into the account the torque moment in the installation drawing and check for firm seating.

Railway Crane
Maintenance Manual

Auxiliary Hoist Reduction Gear Unit including Brake	5.10.1

(P-3/3)

Rope Drum 5.10.2

Description

The rope drum forms a rigid unit with the auxiliary hoist reduction unit. The rope drum coils the hoist rope in several layers.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

1. Visual check
   Check the rope drum for external damage and firm seating.

2. Rope clamp:
   Check the rope clamp for firm seating and damage.

Railway Crane
Maintenance Manual

Rope Drum	**5.10.2**

(P-2/2)

Railway Crane
Maintenance Manual

Derricking Gear **5.11**

(P-1/1)

5.11.1 Derricking Reduction Gear Unit including Brake.
5.11.2 Rope Drum
5.11.3 Rope Pulleys and Rope Guide on the Superstructure

Derricking Reduction Gear Unit including Brake 5.11.1

Description

The derricking gear permits the boom to derricked in and out. The derricking gear is a three- stage planetary gearbox. The equipment includes an integrated, hydraulically lifted multi-disk brake with free- wheeling option and a counter bearing.
The wheels with external toothing have been hardened. The entire gearbox is seated on an anti-friction bearing and is fitted with an oil bath lubrication system.
Power take-off and drive motions have counter rotary directions

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

The maintenance work on the planetary gearbox must be carried out according to the information in the Lohmann& Stolterfoht GmbH User’s Manual.

1. Visual check:
   Check the planetary gearbox, its attachments and all connections for external damage and leakages. Check all connections, lines and links for firm seating.
2. Carry out a running noise check
3. To check the oil level:
   Note: The crane must be in horizontal position to check the oil level.
   - The oil is checked via the overflow meter. To do so, screw out the oil filler plug (item 1) and the oil level inspection plug (item 2); if required top up oil using the brand as classified in the chart in section 6 of this manual.
   - Then screw in both plugs.
4. To carry out an oil analysis:
   Carry out an oil analysis according to the intervals in the maintenance check list.
5. Lubricate the lubrication nipple on the counter bearing.
6. To change the oil:
   Note: The crane must be in horizontal position to change the oil.
   - The oil must be changed when the oil has reached operating temperature.

- Screw out the oil filler plug and the oil level inspection plug. Insert the unattached pipe supplied to the opening on the oil drain plug (item 3). Screw out the drain plug and allow the oil to drain in a suitable and sufficiently large enough tray (approx. 9.5 L oil quantity). Always check the oil for metal pollution and excessive abrasion.
- Then remove the pipe, screw in the oil plug and add oil using the brand as classified in the chart in section 6 of this manual, Monitor the oil level on the level inspection plug.
- Wait a few minutes.
- If the oil level falls, top up the oil until the oil level maintains constant.
- Then screw in the oil filler plug and the oil level inspection plug.

7. To check the screw connections:
   Check the screw connections taking into the account the torque moment in the installation drawing.

Railway Crane
Maintenance Manual

Rope Drum 5.11.2

Description

The rope drum serves to coil the rope. The rope drum is rigidly connected with the planetary gearboxes for the winch drive assembly.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance instructions

1. Visual check:
   - Check the rope drum for external damage.
   - Check the rope clamps for firm seating; if required, re-tighten.
   - Check the rope grooves in the drum for damage and excessive wear when the rope is coiled.

2. Rope clamp:
   Check the rope clamp for firm seating and damage.

Railway Crane
Maintenance Manual

Rope Drum	**5.11.2**

(P-2/2)

Rope Pulley Set and Rope Guide on the Superstructure 5.11.3

Description

The pulley set at the rear of the superstructure and the rope guide on the front of the crane superstructure ensure that the ropes are properly guided in every boom position and thus contribute to safe operation and a long rope service life.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

Rope pulley set:

1. Visual check:
   - Check the rope pulleys for external damage and wear. Any damaged or worn pulleys must be replaced.
   - Check also the rope pulleys for firm seating and whether they move easily; if required, re-tighten.

2. Functional test:
   - Carry out a functional test on the rope pulleys and checked as to whether they move easily and run properly.

Rope guide:

1. Visual check:
   - Check the rope guide for external damage, firm seating and wear, any damaged or loose rope guides must be replaced.
   - Check also the rope pulleys for firm seating and whether they move easily; if required, re-tighten using the torque laid down in regulations.

2. Functional test:
   - Carry out a functional test on the rope guide whether it moves easily and runs properly.

Rope Pulley Set and Rope Guide on the Superstructure **5.11.3**

(P-2/2)

Railway Crane
Maintenance Manual

Recovery Winch **5.12**

(P-1/1)

5.12.1 Recovery Winch including Brake
5.12.2 Rope Drum
5.12.3 Deflection Rollers

Recovery Winch including Brake 5.12.1

Description

The recovery winch is a three–stage planetary gearbox. The equipment consists of an integrated, hydraulically lifted multi-disk holding brake with free-wheeling option.
The wheels with external toothing have been hardened. The entire gearbox is seated on an anti-friction bearing and is fitted with an oil bath lubrication system. The bearing of the drive pinion in the stay pipe is lubricated continuously with grease. Power take-off and drive motions have counter rotary directions.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts - danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instruction

The maintenance work on the planetary gearbox must be carried out according to the information in the Lohmann & Stolterfoht GmbH User’s Manual.

1. Visual check:
   Check the planetary gearbox, its attachments and all connections for external damage and leakages. Check all connections, lines and links for firm seating.
2. Carry out a running noise check.
3. To check the oil level:
   Note: The crane must be in horizontal position to check the oil level. The oil level inspection, oil filler and oil drain plugs are located on the gearbox side (see bottom figure). The counterweight support must be lowered to check the oil level or to carry out an oil change.
   - The oil is checked via the overflow meter. To do so, screw out the oil filler plug and the oil level inspection plug (item 1); if required, top up oil using the brand as classified in the chart in section 6 of this manual.
   - Then screw in both plugs.
4. To carry out an oil analysis:
   Carry out an oil analysis according to the intervals in the maintenance check list.
5. Lubricate the lubrication nipple on the counter bearing.
6. To change the oil:
   Note: The crane must be in horizontal position to change the oil. The oil level inspection, oil filler and oil drain plugs are located on the gearbox side.

- The oil must be changed when the oil has reached operating temperature.
- Screw out the oil filler plug, which is simultaneously the oil level inspection plug, and the oil drain plug and allow the oil to drain in suitable and sufficiently large enough tray (approx. 3.4 L) oil. Always check the drained oil for metallic pollution and excessive abrasion.
- Then screw in the oil drain plug and add oil through the opening using the brand as classified in the chart in section 6 of this manual. Monitor the oil level on the oil level inspection plug.
- Wait a few minutes.
- If the oil level falls, top up the oil until the oil level maintains constant.
- Then screw in the oil filler plug and the oil level inspection plug.

6. To check the screw connections:
   Check the screw connections taking into the account the torque moment in the installation drawing and check for firm seating.

1
2

Rope Drum 5.12.2

Description

The rope drum serves to take up the rope. The rope drum is rigidly connected to the planetary gearboxes for the winch drive assembly.

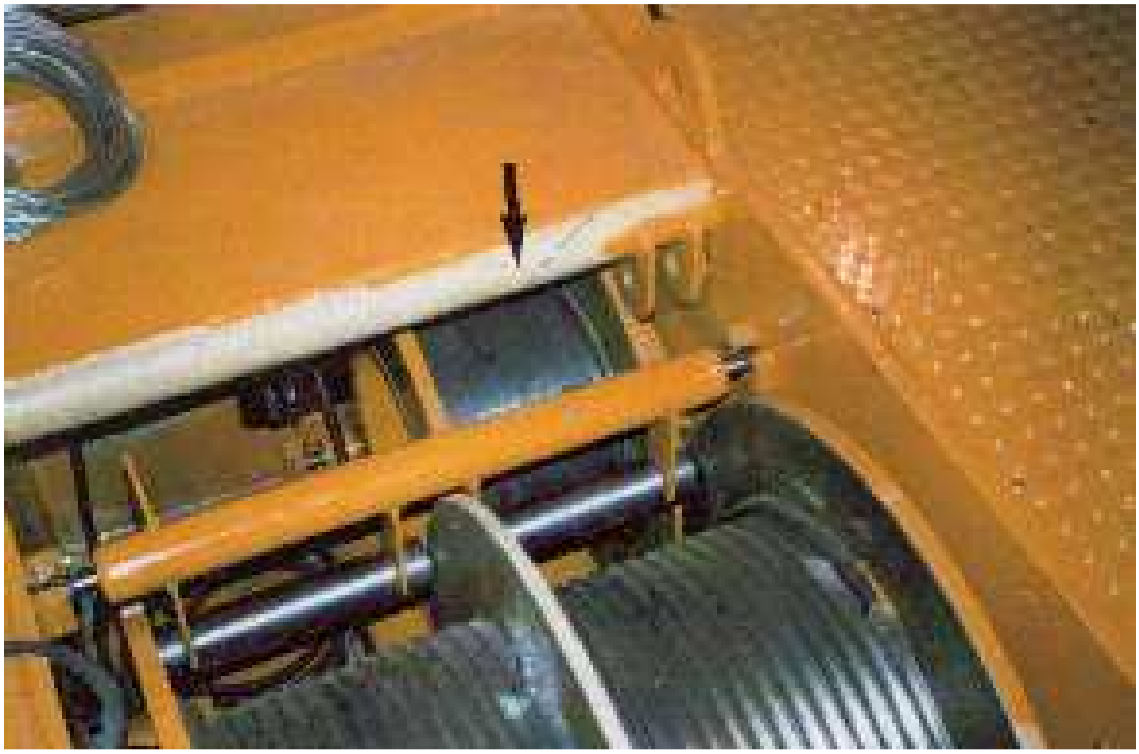
Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   - Check the rope drum for external damage.
   - Check the rope clamps for firm seating; if required, re-tighten.
   - Check the rope grooves in the drum for damage and excessive wear when the rope is uncoiled.

2. Rope clamp:
   Check the rope clamp for firm seating and damage.



Deflection Rolls 5.12.3

Description

The deflection rolls of the recovery winch ensure that the rope is guided properly and contribute to the safe operation and long service life of the ropes.

Safety Instructions

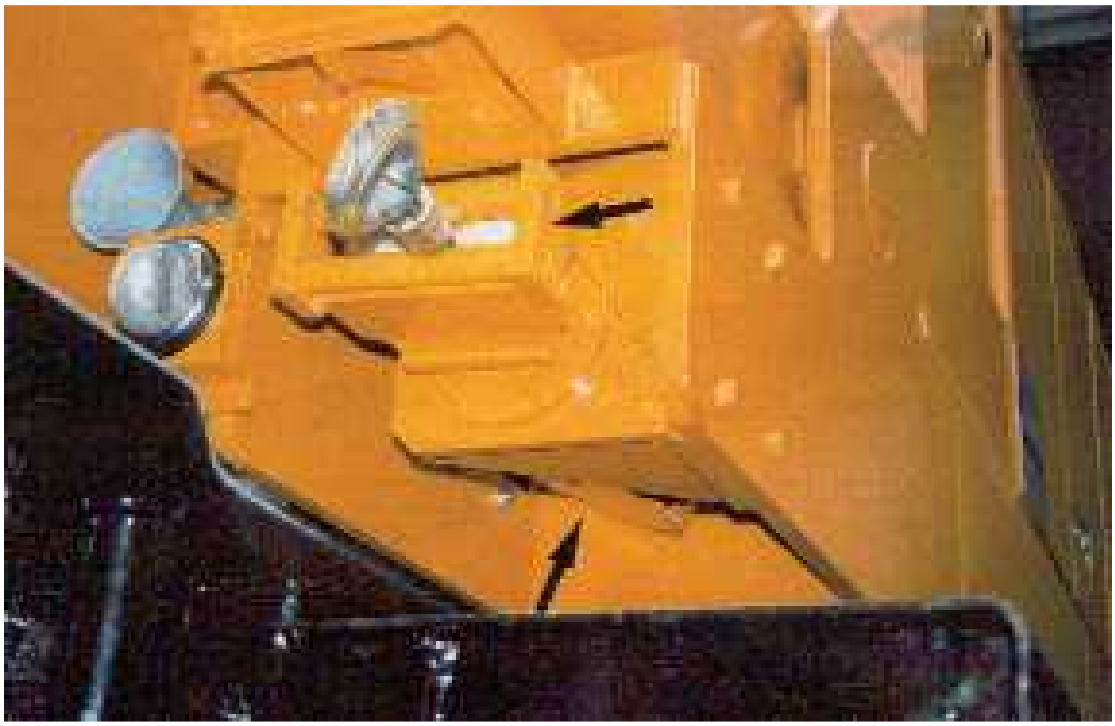
Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual Check:
   Check the deflection rolls for external damage, wear and firm seating. If required, tighten the mounting elements. Replace any damage or worn deflection rolls.

2. Rope clamp:
   Check the rope clamp for firm seating and damage.

3. To lubricate:
   Lubricate the lubrication nipple on the deflection rolls.



Railway Crane
Maintenance Manual

Basic Construction **5.13**

(P-1/1)

5.13.1 Steel Construction
5.13.2 Paintwork
5.13.3 Protective Housing and Panelling
5.13.4 Stairways, Footboards and Supporting Straps
5.13.5 Counterweights
5.13.6 Outrigger Beams
5.13.7 Outrigger Pads
5.13.8 Signs and Labelling
5.13.9 Tool Kit
5.13.10 Superstructure Locking Device
5.13.11 Bogie

Steel Construction 5.13.1

Description

The steel construction supports all the components of the crane and provides it with the required strength and rigidity to carry out its duties for which it is designed. The shape and dimensions of the steel construction have been calculated exactly and thus ensure that crane operation can be carried out safely. The undercarriage has mainly been manufactured in material St 52-3, the superstructure and boom in STE 460 and STE 690.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Please note that the manufacturer must be consulted before any burning, welding or dressing work is carried out on the crane.

Maintenance Instructions

1. Visual Check:
   Check the entire crane steel construction for external damage such as cracks or deformations.

Railway Crane
Maintenance Manual

Steel Construction	5.13.1

(P-2/2)

Paintwork 5.13.2

Description

The supporting steel construction has been prepared for paintwork by means of a sand-blasting de-rusting procedure as per SAE 2.5 and then primed with 2-component epoxy resin. 2-component polyurethane high solid top coat has been used for the top coat.
The non-supporting steel construction has been prepared for paintwork by means of manual de-resting and primed with 2-component epoxy resin. 2-component acrylic polyurethane high solid top coat has been used for the top coat.

Safety Instructions

Before maintenance work is performed, it must be ensureD that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Rubber parts, seals and cylinder piston rods must not be painted!
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

Note: Only paint and primer indicated above may be used.

1. Visual check:
   Check all components for paintwork damage and corrosion. Touch-up work should only be carried out when the weather is dry.

2. To eliminate paintwork damage:
   The paintwork must be thoroughly de-rested and primed three times using a paintbrush. Then a sufficiently thick top coat must be applied.
   - Primer: Epoxy resin 2-component primer
   - Top coat: 2-component polyurethane high-solid material.

Protective Housing and Panelling 5.13.3

Description

The protective housing and panelling screen off hot and moving components and protect persons near the components. Simultaneously, the components are protected against moisture and other external influences.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame - use caution - danger of explosion near fuel and oil related components!
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
When electrical welding work is being performed, the earthling terminal must be connected directly to the part to be welded. In addition, the battery pole terminals on the diesel engine system and the emergency diesel engine system must be disconnected.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instruction

1. To clean:
   Prior to commencing with inspection and maintenance work, clean the protective housing and panelling with a suitable aid. This applies, in particular, to the stairway and walkway areas. Only and greasy components increase the danger of slipping!
2. Visual check:
   Check the protective housing and panelling for external damage.
3. To eliminate paintwork damage:
   Clean the damaged areas. Eliminate the damage with suitable knifing filler, glass fiber mats and polyester or corresponding primer and paintwork and then touch-up with paint.
4. To straighten deformations and paint:
   Damage on minor components must be straighten and touched up with paint.
5. To check the hinges, locks and storm hook:
   Oil the hinges and locks on the doors and check for proper functioning. Check the storm hooks on the doors for external damage and proper functioning.

Railway Crane
Maintenance Manual

Protective Housing and Panelling	**5.13.3**

(P-2/2)

Stairways, Footboards and Holding Straps 5.13.4

Description

The stairways, footboards and holding straps provide an easy and safe hold when climbing into the cab and onto the crane. They have anti-slip, weather-proof treads.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame - use caution - danger of explosion near fuel and oil related components!
When electrical welding work is being performed, the earthling terminal must be connected directly to the part to be welded In addition, the battery pole terminals on the diesel engine system and the emergency diesel engine system must be disconnected.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment

Maintenance Instructions

1. To clean:
   - Clean the stairways, footboards and the walking surfaces and their mountings thoroughly with a corresponding cleaning agent. The oil and grease film on stairways increase the danger of slipping!

2. Visual check :
   - Check the stairways, footboards and holding straps and their mountings for damage and firm seating.
   - Missing screws must be replaced and loose connection must be replaced.

3. Paintwork damage
   - Clean the paintwork damage immediately and protect against corrosion using primer and the corresponding paint.
   - Primer: Epoxy resin 2- component primer
   - Top coat: 2- Component polyurethane high – solid material

4. To straighten deformations and paint:
   - Damage on minor components must be straighten and touched up with paint.

Railway Crane
Maintenance Manual

Counterweight 5.13.5

Description

The three-section steel counterweight, which can be detached for transport purposes, is mounted on the counterweight support.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame - use caution - danger of explosion near fuel and oil related components!
When electrical welding work is being performed, the earthling terminal must be connected directly to the part to be welded In addition, the battery pole terminals on the diesel engine system and the emergency diesel engine system must be disconnected.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   Check the counterweight and the mountings for external damage and cracks.

2. Paintwork damage
   - Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   - Primer: Epoxy resin 2- component primer
   - Top coat: 2- Component polyurethane high – solid material

Outrigger Beams 5.13.6

Description

The outrigger beams are extended and retracted via a hydraulic cylinder. The outrigger beams are latched in transport position by means of socket pins.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   Check the outrigger beams for external damage, cracks, fractures and deformations.

2. Paintwork damage
   - Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   - Primer: Epoxy resin 2- component primer
   - Top coat: 2- Component polyurethane high – solid material

3. To lubricate:
   The bearings of the outrigger beams on the undercarriage are fitted with one lubrications nipple each on the upper and lower sides. Remove the waste grease and lubricate until the bearing points are protected by means of a surrounding bead of grease.

4. Functional test:
   Check the outrigger beams as to whether they extend and retract properly and whether they lock properly.

Outrigger Beams **5.13.6**

(P-2/2)

Outrigger Pads 5.13.7

Description

The outrigger pads are hinged to transfer the support forces for the crane evenly into the ground.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fall the respective safety instructions on the packages.
When dressing with a flame - use caution - danger of explosion near fuel and oil related components!
When electrical welding work is being performed, the earthing terminal must be connected directly to the to the part to be welded. In addition, the battery pole terminals on the diesel engine system and the emergency diesel engine system must be disconnected.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   Check the outrigger pads for external damage, cracks, fractures and deformations. Likewise check the mounting bolts and the safety pins as to whether they are in good condition.

2. To clean and to grease:
   Clean the Knuckle joints and then protect against corrosion by greasing.

Outrigger Pads	**5.13.7**

Signs and Labelling 5.13.8

Description

The Crane has the usual, prescribed signs for the railway. In addition, the crane is equipped with a number of labelling for various areas.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fall the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

1. Visual check:
   Check all signs and labelling in the crane as to whether they are easily read.
   Clean any dirty signs. Repair or replace any damaged signs.

Tool Kit 5.13.9

(P-1/1)

Description

The tools in the tool kit (not illustrated) provided represent an appropriate basic kit which can be used for work in the event of malfunctions or for maintenance work.

Safety Instructions

Any faulty or improperly used tool can cause damage to the components and injuries to personnel. This is why faulty tools must be replaced immediately.

Maintenance Instructions

The tool kit is located behind the seat in the cab. Check the kit as to whether it is complete and the kit has a lock. Also check the condition of the tools.

1. Take inventory
   - Hammer, 800 g
   - Flat chisel
   - Oil spray can
   - Hand lever-operated grease gun
   - 17 Double–ended open-jawed spanners, 8x10 - 55x60
   - 6 Single- ended open–jawed spanners, 8/41/65/70/75/80 mm
   - 8 Hex. Socket head wrench, SW 6 /8/10/12/14/22/27/32
   - 4 Tubular hex. box spanners, 13x7/19x22/24x30/30x36
   - 4 Tommy bars s for spanners, A10/12/16/18
   - Standard rachet,1/2”
   - Extension piece,10”
   - Articulated square-drive socket adapter, 70mm
   - Socket for wrenches, SW 17/19
   - 3 screw drivers
   - Light tester
   - Pressure gauge, 0-400bar
   - Hose, DN /222bx5000
   - Pressure gauge connection fitting
   - Union nuts
   - Cutting ring
   - Seeger circlip ring pliers, A3/A4
   - Flat-nosed and cutting nippers
   - Pipe wrench
   - Sickle spanner
   - Hose, NW 18x 3 5000

Superstructure Locking Device 5.13.10

Description

The superstructure locking device serves to secure the superstructure against rotation during transport. The superstructure is locked when the counterweight support is lowered.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Please note that the manufacturer must be consulted before any burning, welding or dressing work is carried out on the crane.

Maintenance Instructions

1. Visual check:
   Check the entire locking device, cracks fracture and deformations.

2. To clean and to grease:
   Clean the knuckle joints thoroughly with a suitable aid and then grease to protect against corrosion.

3. Paintwork damage:
   - Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   - Primer: Epoxyd resin 2-component primer.
   - Top coat: 2-component polyurethane high-solid material.

Railway Crane
Maintenance Manual

Superstructure Locking Device	5.13.10

Bogies 5.13.11

Description

The crane has 2 bogies which support 3 wheel sets each. In addition, a travel gear reduction unit including the disengaging device, a brake system and a suspension assembly are located in each of the bogies. The undercarriage is seated on the bogies above bogie pivots.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Please note that the manufacturer must be consulted before any burning, welding or dressing work is carried out on the crane.

Maintenance Instructions

2. Visual check:
   Check both bogies for external damage, cracks and deformations.

2. Paintwork damage:
   Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   Primer: Epoxyd resin 2- component primer
   Top coat: 2- Component polyurethane high–solid material

3. To lubricate:
   The pivot bearing assembly (item 1) between the undercarriage and the bogies is maintenance-free.
   The side bearings (item 3) between the undercarriage and the bogie must be lubricated regularly.

4. The side bearing clearance:
   The clearance between the side bearings (item 4) on the undercarriage and on the bogies must be checked

Railway Crane
Maintenance Manual

Boom	**5.14**

(P 1/1)

5.14.1 Boom and Root Point
5.14.2 Rope Pulleys
5.14.3 Rope Guides
5.14.4 Boom Support Block

Boom and Root Point 5.14.1

Description

The boom is seated on an open-type root point. In transport position, the boom is lowered onto the match truck and lifted out of the boom root via hydraulic cylinders. In this way, the superstructure and boom can move freely of one another in towing operation.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Please note that the manufacturer must be consulted before any burning, welding or dressing work carried out on the crane.

Maintenance Instructions

1. Visual check:
   Check the boom for external damage and cracks.

2. Root Point:
   Clean the bearing sleeves of the shafts on the boom root point when they are disengaged and then protect against corrosion by greasing. If the crane is subject to extreme external conditions, e.g. sea air, a high degree of dust and sand, maintenance must be carried out on the boom root in-between the intervals indicated.

3. Paintwork damage:
   - Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   - Primer: Epoxyd resin 2—component primer
   - Top coat; 2 – component polyurethane high-solid material

   Caution! –The sliding tracks must be not be soiled by paint and should not be painted.

Railway Crane
Maintenance Manual

Boom and Root Point	**5.14.1**

(P-2/2)

Rope Pulleys 5.14.2

Description

The rope pulleys serve to guide the ropes precisely to the boom head. They ensure that the rope runs properly in every boom position.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution near the overhead lines! Do not climb up onto the crane superstructure! Mortal danger!

Maintenance Instructions

1. Visual check:
   Check for the rope pulleys for external damage, firm seating and excessive wear. Any damaged or worn pulleys must be replaced immediately.

2. Functional test:
   Once the pulleys have been re-installed, carry out a functional test.

Railway Crane
Maintenance Manual

Rope Pulleys	**5.14.2**

(P-2/2)

Rope Guides 5.14.3

Description

The rope guides permit the ropes to be guided cleanly and prevent, in particular, the ropes from being sheared by the boom.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame - use caution - danger of explosion near fuel and oil related components!
When electrical welding work is being performed, the earhting terminal must be connected directly to the part be welded. In addition, the battery pole terminals on the diesel engine system and the emergency diesel engine system must be disconnected.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution near the overhead lines! Do not climb up onto the crane superstructure! Mortal danger!

Maintenance Instructions

The good condition of the rope guide is important for a long hoist rope service life.

1. Visual check:
   Check the rope guides for external damage and firm seating. Any damaged or loose rope guides can damage the rope.

2. To clean:
   Clean rope guides with a suitable aid.

Railway Crane
Maintenance Manual

Rope Guides	**5.14.3**

(P-2/2)

Boom Support 5.14.4

Description

The boom support (not illustrated) on the match truck supports the boom head when the boom is lowered during towing operation.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The Crane must not be in the way of other vehicles.
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Please note that the manufacturer must be consulted before any burning, welding or dressing work is carried out on the crane.

Maintenance Instructions

1. Visual check:
   Check the boom support for external damage and firm seating. Check the moving latching unit for external damage and firm seating. Check whether it moves easily.

2. To clean and to grease:
   Clean and grease the knuckle joints and sliding surfaces.

3. Paintwork damage:
   - Clean the paintwork damage immediately and prime and protect against corrosion with the corresponding paint.
   - Primer: Epoxy resin 2-component primer
   - Top coat: 2-component polyurethane high –solid material.

Railway Crane
Maintenance Manual

Ropes and Lifting Gear **5.15**

(P-1/1)

5.15.1 Ropes
5.15.2 Hook Blocks

Ropes 5.15.1

Description

The ropes are of the following types:

Hoist ropes:	rotation, resistant, flexible hoist rope with a compacted steel core (langs lay);
Derricking ropes:	8-strand rope made out of conventional strands (langs lay)

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution near the overhead lines! Do not climb up onto the crane superstructure.

Maintenance Instructions

Inspection:
Wire ropes are consumable items with a limited life. This is why the wire ropes and rope fittings must be inspected daily. The complete length of the ropes must be inspected. In addition, the wire ropes must be examined for operating safety by a competent person in regular intervals. The intervals should be scheduled so that any damage will be detected early. This is what during the first few weeks after the installation of a new rope and after the first broken wire or other damage the intervals should be reduced accordingly.
If the rope has been overloaded or if non-visible damage is suspected, the intervals between examinations should be reduced accordingly (if required, every few hours)
Moreover, an examination should be carried out when the rope is put back into service after long periods of standstill.
A wire rope must be removed in time to maintain crane operating safety. The following criteria based on DIN (German Industrial Standards) 15020 determine whether a rope must be discarded:

1a) Type and number of wire breakages-
Main hoist and derricking ropes (rope diameter: 26 mm):
If the rope shows more than 5 wire breakages on a length of 6 x diameter or 10 on a length of 30x diameter, the rope is unserviceable and must be discarded.
Auxiliary hoist ropes (rope diameter: 22mm):
If the rope shows more than 5 wire breakages on a length of 6 x diameter or 13 on a length of 30 x diameters, the rope is unserviceable and must be discarded.

1b) Position of the wire breakages
When wire basketing occurs or if a stand breaks, the rope is immediately unserviceable.

1c) Inevitable wire breakages
As wire breakage occurs after a certain number of operating hours and then the number increases more quickly, it is recommended to observe the times in which breakages occur so as to be able to judge the overall condition of the rope.

2. Rope diameter contraction during operating time:
If the rope diameter over a greater length is reduced by 15% or more from the actual measured rope diameter in new condition (nominal damage) the rope is no longer serviceable.

3. Corrosion:
To what degree the ropes are subject to corrosion will depend very much on the crane site (e.g. ocean atmosphere). Should the rope show a high degree of corrosion, the rope is no longer serviceable.

4 Wear through friction:
If the rope diameter is reduced by 10% or more through wear by friction the rope is no longer serviceable.

5 Rope deformations
Deformations in the rope such as waviness, birdcaging, loop formations, loose wires, nodes, rope thinning, misplaced outer wires, kinks and flat areas are visible changes in the rope structure. A rope with such deformation is no longer serviceable.

Rope change:
If a rope change is necessary, it must be ensured that a wire rope of the same type and breaking strength as the original wire rope in new condition is fitted. When a new rope is being mounted, ensure that it is not twisted. Prior to operating with a newly fitted rope, it must be ensured that the rope is properly reeved and guided in the grooves of the rope drum, rope pulleys and the compensation rollers. In particular, for the ropes on the derricking gear (2 ropes on drum), it is advisable to always change both ropes at the same time to ensure the same rope quality and to maintain the same inspection and maintenance intervals.

Functional test:
In particular, a functional test without load is to be conducted after a rope change. During the test it should be ensured that the rope runs smoothly, the rope coils properly and the limit switches function. After a wire rope has been mounted and before it begins its actual works, load tests with very light loads should be carried out for at least an hour.

Cleaning, greasing:
Wire popes must undergo maintenance regularly. However the kind of maintenance will depend on how much the rope is used. Regular maintenance may considerably increase the service life of steel wire rope. During production, the rope receives intensive lubrication. This in-process treatment will provide the rope with ample protection against corrosion and is meant to reduce the friction between the elements which make up the rope as well as the friction between rope and sheaves or drums. This lubrication, however, only lasts for a limited time and should be re-applied periodically. When choosing the relubricant, it must be ensured that it is in accordance with the recommendations of the rope manufacturer.

It is important that relubrication of steel wire ropes is carried out regularly right from the beginning of the service life of the rope and not only after the first damage has been ascertained !

Clean the ropes with a suitable aid and then lubricate. As dirt can reduce the service life of a rope considerably, depending on crane site, it may be necessary to clean and grease the rope in-between the indicated intervals.

Railway Crane
Maintenance Manual

Ropes	**5.15.1**
	(P-3/3)

Hook Blocks 5.15.2

Description

The crane has two hook blocks each for the main hoist and the auxiliary hoist.

Safety Instructions

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a “Maintenance Work” warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts – danger of getting burnt, crushed or drawn into the equipment!
Use caution near the overhead lines! Do not climb up onto the crane Superstructure! Mortal danger!

Maintenance instructions

1. Visual check:
   Check the entire hook block for external damage and cracks. Any damaged parts must be replaced immediately!

Railway Crane
Maintenance Manual

Hook Blocks	5.15.2

Railway Crane
Maintenance Manual

Fuel, Oil and lubricant Chart **6**

(P-1/3)

Symbol/ Fluid/ Filling Capacity:		Classification	Ambient temperature range:
A	Diesel engine oil Filling capacity: approx. 39 l incl. filter- change	SAE Viscosity API CE	**Please note:** Observe the Cummins User's Manual Temperature range: / SAE viscosity class: -40^0 to $+20^0$C — SAE 5 W 30 -25^0 to $+20^0$C — SAE 10 W 30 -10^0 to $+45^0$C — SAE 15 W 30
B	Diesel engine Coolant Filling capacity: 75 l mixture incl. filter change	50% anti-freeze with lower silicate percentage as per GM 6038-M 50% soft water (Degree of hardness < 300 ppm) with Fleet guard DCA4-share of 1 to 2 units per 3.8 litres of coolant	**Please note**: Observe the Cummins User's Manual. All zones outside arctic temperature zones.
C	Emergency diesel engine oil Filling capacity approx. 5.5 litres	SAE viscosity	**Please note:** Observe the Kirloskar User's Manual Temperature range: / SAE viscosity class: -5^0 to + 45^0C — SAE 20 W 40 -10^0 to $+40^0$C — SAE 15 W 40 -20^0 to $+20^0$C — SAE 10 W 30
D	Diesel fuel for diesel engine and emergency diesel engines	IS-No. 1460	**Please note:** Observe the Cummins / Kirloskar User's Manuals
E	Lube oils for Pump-distributor gearbox Filling capacity approx. 6 litres	As per DIN 51517 T3: CLP 150 ISO viscosity as per DIN 51519: ISO-VG 150 Kinematic viscosity: min. 135 mm^2/s (cSt) max. 165 mm^2/s (cSt) FZG test A/8.3/90 as per DIN 51354 T2: min. breakdown load stage 12	Oil brands: see Lohmann und Stolterfoht- User's Manual

Symbol/ Fluid/ Filling Capacity:		Classification	Ambient temperature range:
F	Molykote copper paste for lubrication of bearings knuckle joints + brake cylinder expanders	Cu 7439 Plus	**Please note**: Observe the BSI-Verkehrs technik User's Manual.
G	To loosen brake cylinder expander unit fitting + connections.	Creep oil	**Please note:** Observe the BSI-Verkehrs technik User's Manual.
H	Brake test agent	To carry out magnetic powder test	**Please note**: Observe the BSI-Verkehrs technik User's Manual.
I	Brake magnetic test powder	To carry out magnetic powder test	Please not: Observe the BSI-Verkehrs technik User's Manual.
J	Brake chemical agents	To clean dirty components	**Please note:** Observe the BSI-Verkehrs technik User's Manual.
K	Undercarriage air pressure compressor lube oil Filling capacity: of each: 0.5 l	SAE viscosity API CC or CD	Temperature range: / SAE viscosity class: 0^0 to $+60^0$C / SAE 40 -5^0 to $+50^0$C / SAE 30 -15^0 to $+40^0$C / SAE 20 -25^0 to $+30^0$C / SAE 10
L	Lube oil for: • slew gear reduction unit Filling capacity: approx. 15.5 l • Main hoist reduction gear unit Filling capacity approx. 6.5 l • Auxiliary hoist reduction gear unit.	As per DIN 51517 T3: CLP 150 LS 2 ISO viscosity as per DIN 51519: ISO-VG 100 Kinematic viscosity: min. 90.0 mm^2/s (cSt) max. 110.0 mm^2/s (cSt) FZG test A/8,3/90 nach DIN 51354 T2: min. breakdown load stage 12	Oil brands: see Lohmann und Stolterfoht User's Manual

Symbol/ Fluid/ Filling Capacity:		Classification	Ambient temperature range:
	Filling capacity: approx. 6.5. l • Derricking gear reduction unit Filling capacity: approx. 9.5 l • Recovery winch reduction unit Filling capacity: approx, 3.4 l • Travel gear reduction unit. Filling capacity of each: 12 l		
M	Lube grease for counter bearing on * Main hoist reduction- gear unit * Auxiliary hoist reduction gear unit * Derricking reduction gear unit	Lithium –MZ grease NLGI 3 K2K DIN 51825	All zones
N	Hydraulic oil	ATF ESSO SUFFIX A	all zone
O	Gearwheel /pinion lube grease	ESSO EP Grease 350	-20^0 - $+120^0$C
P	Roller slew ring lube grease-	ESSO Beacon EP25	-25^0 - $+130^0$C
Q	Axle gearbox pinion lube grease	Like O	

Torque Moments 7

The bolt torque moments indicated here apply when no other values for the torque moments of the individual bolts are provided in the Maintenance Manual. The bolt size is based on the metric system in accordance with DIN (German Industrial Standards) and the bolt quality is based on ISO 898, Section I.

Bolt Classification

Bolt Size	8.8	10.9	12.9
M 4	2.8 Nm	4.1 Nm	4.8 Nm
M 5	5.5 Nm	8.1 Nm	9.5 Nm
M 6	9.6 Nm	14 Nm	16 Nm
M 8	23 Nm	34 Nm	40 Nm
M 10	46 Nm	67 Nm	79 Nm
M 12	79 Nm	115 Nm	135 Nm
M 14	125 Nm	185 Nm	220 Nm
M 16	195 Nm	290 Nm	340 Nm
M 18	280 Nm	400 Nm	470 Nm
M 20	395 Nm	560 Nm	660 Nm
M 22	540 Nm	760 Nm	890 Nm
M 24	680 Nm	970 Nm	1,150 Nm
M 27	1,000 Nm	1,450 Nm	1,700 Nm
M 30	1,350 Nm	1,950 Nm	2,300 Nm
M 8 X 1	25 Nm	37 Nm	43 Nm
M 10 X 1.25	49 Nm	71 Nm	83 Nm
M 12 X 1.25	87 Nm	130 Nm	150 Nm
M 12 X 1.5	83 Nm	120 Nm	145 Nm
M 14 X 1.5	135 Nm	200 Nm	235 Nm
M 16 X 1.5	210 Nm	310 Nm	360 Nm
M 18 X 1.5	315 Nm	450 Nm	530 Nm
M 20 X 1.5	440 Nm	630 Nm	730 Nm
M 22 X 1.5	590 Nm	840 Nm	980 Nm
M 24 X 2	740 Nm	1,050 Nm	1,250 Nm
M 27 X 2	1,100 Nm	1,550 Nm	1,800 Nm
M 30 X 2	1,500 Nm	2,150 Nm	2, 500 Nm

Railway Crane
Maintenance Manual

Maintenance Diagrams **8**

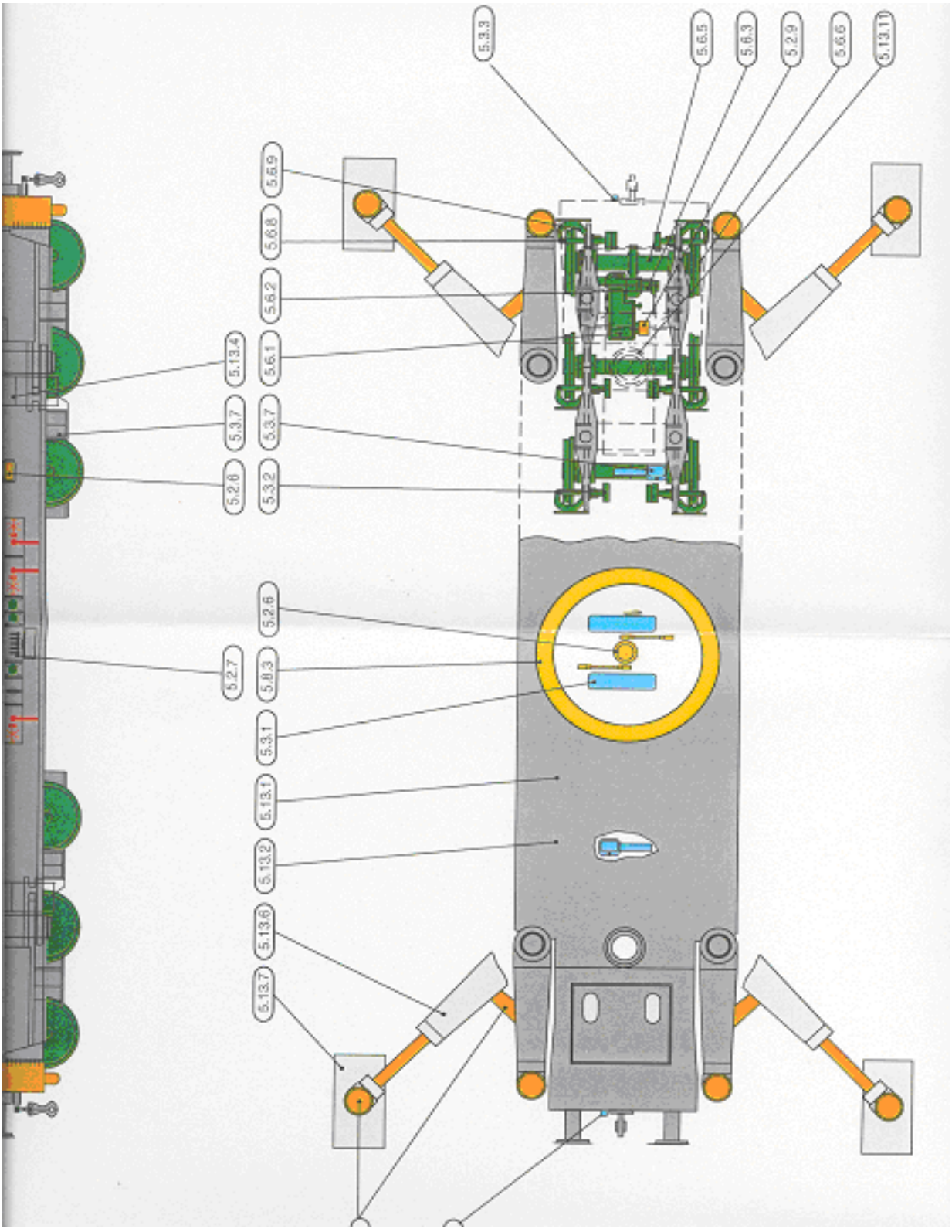
(P-1/1)

8.1 Undercarriage Maintenance Diagram
8.2 Superstructure maintenance Diagram
8.3 Boom Maintenance Diagram

Railway Crane
Maintenance Manual

Undercarriage Maintenance Diagram **8.1**

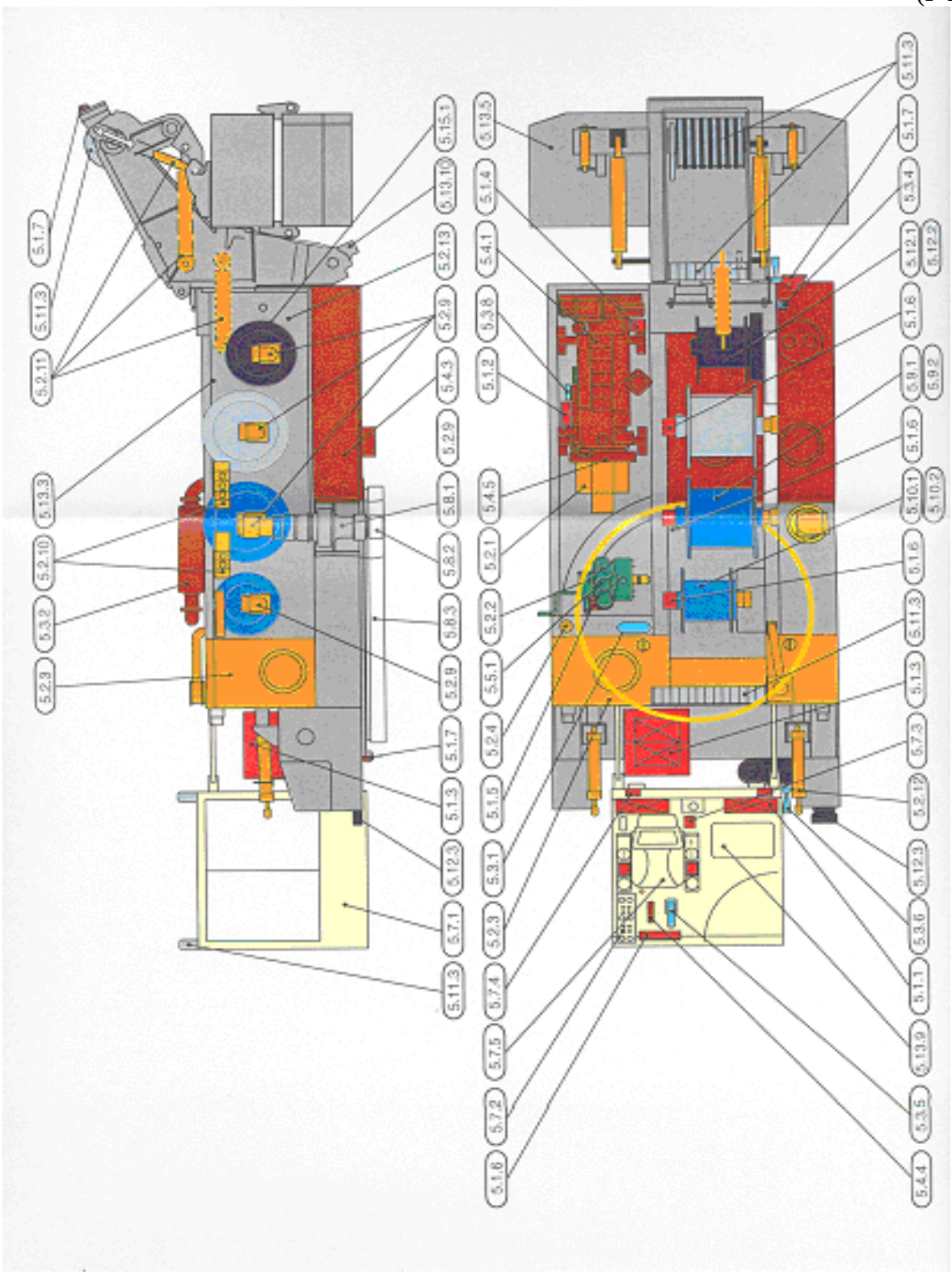
(P 1/1)



Railway Crane
Maintenance Manual

Superstructure maintenance Diagram **8.2**

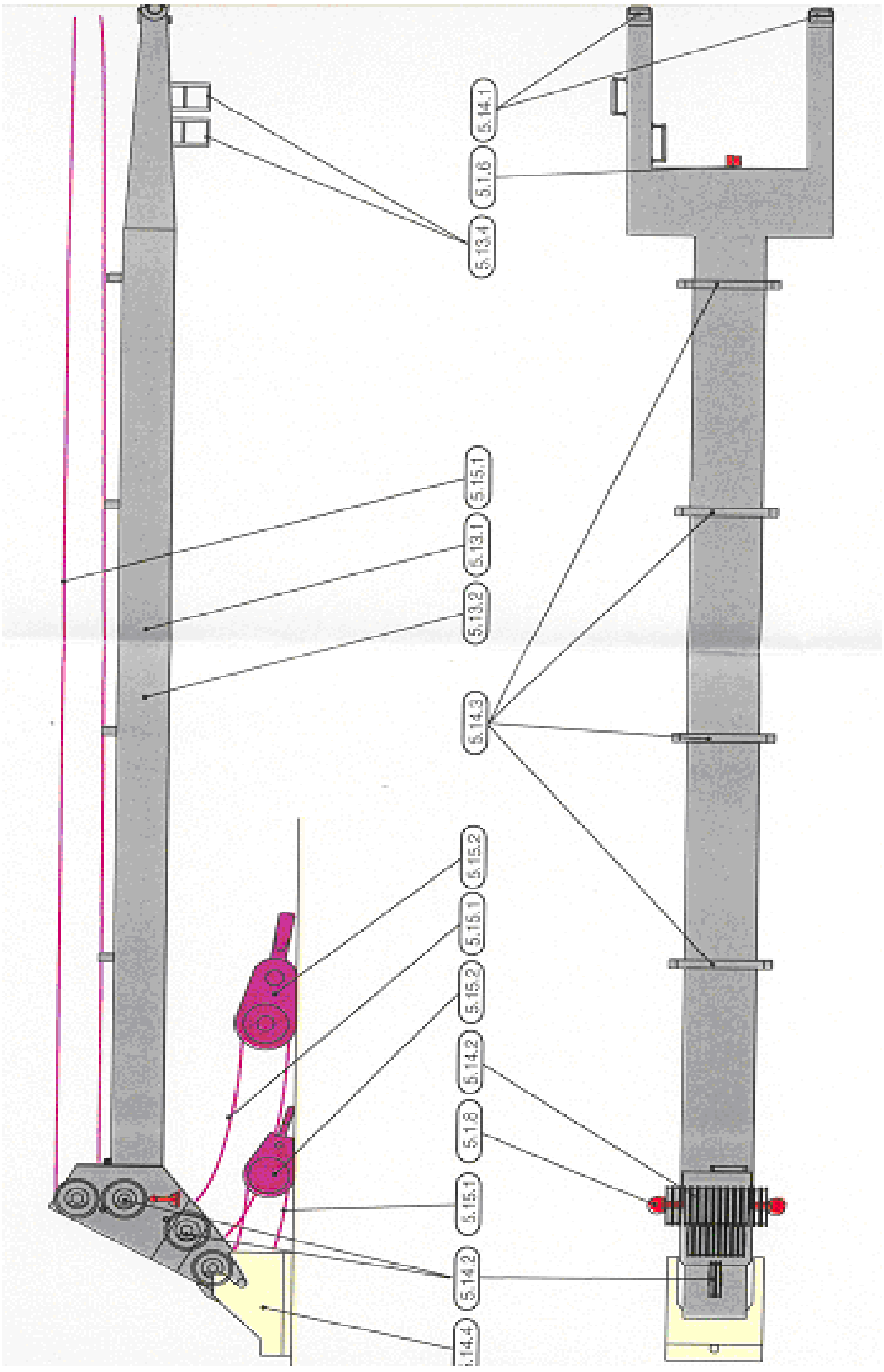
(P 1/1)



Railway Crane
Maintenance Manual

Boom Maintenance Diagram **8.3**

(P-1/1)



Railway Crane
Maintenance Manual

Supplier Documentation **9**

0 Recovery winch Type: GFT 36 W3 2021
1 Derricking gear: type: GFT W3 8228, German
2 Hoist 1: Type: GFT W3 8228, German
3 Hoist 2: Type: GFT 26 W2 8022, German
4 Slewing gear: Type: GFB 80 T3 1008, German
5 SAB brake unit, mode PBACF servicing regulations
6 SAB brake unit, model PBAC servicing regulations
7 Gutehoffnungshutte Radsatz GmbH / Drive and running wheel sets
8 BSI - wheel brake disk manual R780G
9 BSI - brake cylinder expander unit manual
10 PAT- safe load indicator / Operating Manual IK350/1327
11 Wabco, Instruction Recommendations and Maintenance Instructions for the compressors
12 Kirloskar Oil Engines limited Type: HA 294
13 Cummins Diesel Engine
14 Pump distributor gearbox GFC 230 1048